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No. 1

THE INTEGUMENTARY SENSE ORGANS OF THE LARVÆ OF RHIPICEPHALINÆ (ACARINA)¹

BY J. DINNIK and F. ZUMPT²

In 1938 Delpy published a short paper describing the location and morphology of the so-called spiracles or respiratory plates ("stigmata respiratoires") of various Ixodid larvæ. He examined for the purpose *Hyalomma dromedarii* Koch, *H. impressum* Koch, *Boophilus annulatus* Say, *Rhipicephalus bursa* Can. and Fanz., and *Hæmaphysalis cinnabarina punctata* Can. and Fanz. Delpy's description is brief and lacks illustrations. He thought that he saw within each "spiracle" 1 or 2 pores, sometimes reduced in size, leading into an atrium provided with two valves at the entrance. The base of the atrium he described as pierced with an opening, and Delpy considered it possible that a tracheal tube was attached at this point.

With regard to their position, Delpy distinguished coxal and abdominal spiracles. The coxal spiracles are in three pairs, placed behind each of the six coxæ. The abdominal spiracles vary greatly in number and position according to the genus. *Hæmaphysalis* is said to have four pairs, *Hyalomma* and *Rhipicephalus* only one pair, while they are entirely lacking in *Boophilus*.

Delpy was not the first, however, to describe supposed spiracles in Ixodid larvæ. Salmon and Stiles (1902) saw

¹ Preliminary Study No. 10 for a Revision of the Genus *Rhipicephalus* Koch. Nos. 1 to 8 of this series were published in the Zeitschrift für Parasitenkunde from 1939 to 1943. No. 9 is to appear in Dechiana (Festschrift f. Prof. Reichensperger).

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them before, and they were also mentioned by Oudemans (1906), Zebrowski (1926) and Cooley (1938).

All these authors were mistaken in the interpretation of the function of the organ they had seen. The larvæ of the Ixodidæ do not possess any special respiratory organs. Only Samson (1908) correctly recognized that the so-called "larval spiracles" described by Salmon and Stiles were actually the terminal pores of integumentary sense organs. This correction was, however, overlooked up to quite recently. Even Vitzthum, in his account of the Acarina for "Bronn's Klassen und Ordnungen des Tierreichs" (1940), adopted in detail the description and views of Delpy.

K. W. Neumann (1942) and Elishewitz (1942) first re-examined these structures in an attempt to decide whether they were respiratory organs or integumentary glands. Serial sections of larvæ of *Dermacentor*, *Hæmaphysalis*, *Hyalomma* and *Ixodes* convinced Neumann that neither the Ixodinæ (Prostriata) nor the Rhipicephalinæ (Metastriata) have respiratory organs and that the structures thus far interpreted as spiracles are really integumentary glandular organs.

According to Neumann, these organs are in a direct view more or less oval in outline. "A broad ellipsoid chitinized frame at the periphery is attached to the surrounding cuticula by means of a narrow, prominent, striated edge. The lumen also is oval and contains two parallel, non-contiguous lips. Two small protuberances of the frame extend on each side into the lumen, keeping the lips from touching each other. By lowering the objective, a small circular opening may be recognized in the center between the lips."

"In a side view of the entire organ or in a section, the structure is also more or less elongate oval. The walls consist of a rather thick layer of chitin, decreasing in thickness from the base toward the surface opening. A short duct leads from the base toward the interior of the body. On either side of the mouth of this duct a tooth, anchored to the base of the organ, extends up into its lumen. Serial sections show that these teeth arise from a folding of the walls. Their length is approximately three-fourths of that of the entire organ."

"To what do these several parts correspond? The broad frame is the wall, the lips are the teeth, and the circular opening is the mouth of the short duct." (See Pl. 1, fig. 1.)

"The organ is securely anchored in the cuticula by the upper third of its length. The subjacent hypodermal cells are broader than high and surround the organ. The adjacent cells (?generative cells) are much higher than broad. Only two seem to be present, placed parallel to the margins of the lips. A large cell, considerably broader than high, lies beneath the organ, in close contact with the entire basal surface. The duct mentioned before is never long enough to pierce this basal cell, but ends with it without tapering downward. The duct is never lined with a tænidium. So far as can be detected, the plasma of this cell is slightly granular, but a prominent clear spot in the center may be interpreted as an internal vesicle. It follows from this description that the structure is an integumentary glandular organ, not a larval respiratory organ with a spiracle and a rudimentary trachea."

So much for K. W. Neumann's account of the morphology of his integumentary sense organ. In addition he discusses the number and position of these organs in various genera and believes to be justified in stating that originally two pairs were present. According to his account, all the spiracle-like organs show essentially the same structure, though they are sometimes reduced in size, and they seem undoubtedly to be peculiar to the larvæ. He does not mention any other integumentary sense organs besides these so-called "spiracles."

P. Schulze (1942a) published a detailed study of the integumentary sense organs of adult ticks and found, besides true sensory setæ (sensilla trichoidea), four other types of sensilla which he called *Sensilla auriformia* (ear-shaped organs), *Sensilla sagittiformia* (arrow-shaped organs), *Sensilla hastiformia* (spear-shaped organs), and *Sensilla laterniformia* (lantern-shaped organs).

Large numbers of these organs are located within the hard and soft chitinized integument of the body. On the other hand they are sparse on the legs and palps and,

strangely enough, seem to be entirely missing on the chelicerae. Characteristic for these sensilla is their connection with two glandular cells which extend partially into the sensory duct. These cells secrete into the duct a substance which emerges at the surface after passing an end organ. P. Schulze assumes that the secretion serves as a protective coating against evaporation within the sensillum and on the outer surface, and also as a chemical means of recognition between opposite sexes and individuals of one species.

The sensory function of the sensilla auriformia seems to be of a proprio-receptive nature, serving to perceive changes or shifts within the chitin. It is probable that the other three types, grouped together as "tuft-shaped" sense organs or krobylophores, are vibro-chemoreceptive organs, which react at the same time to chemical as well as to seismic stimulation. They evidently play an important part in the sexual life of the ticks.

We examined the larvæ of *Rhipicephalus sanguineus* Latr., *Rh. appendiculatus* Neum., *Rh. bursa* Can. and Fanz., *Rh. evertsi* Neum., *Rh. simus* Koch, *Hyalomma dromedarii* Koch, and *Boophilus calcaratus* Birula.

The larvæ were merely mounted whole on microscopic slides in Berlese's medium, a procedure which we found to be superior for our purpose to all other methods of mounting. Owing to prevailing conditions we were unable to make sections.

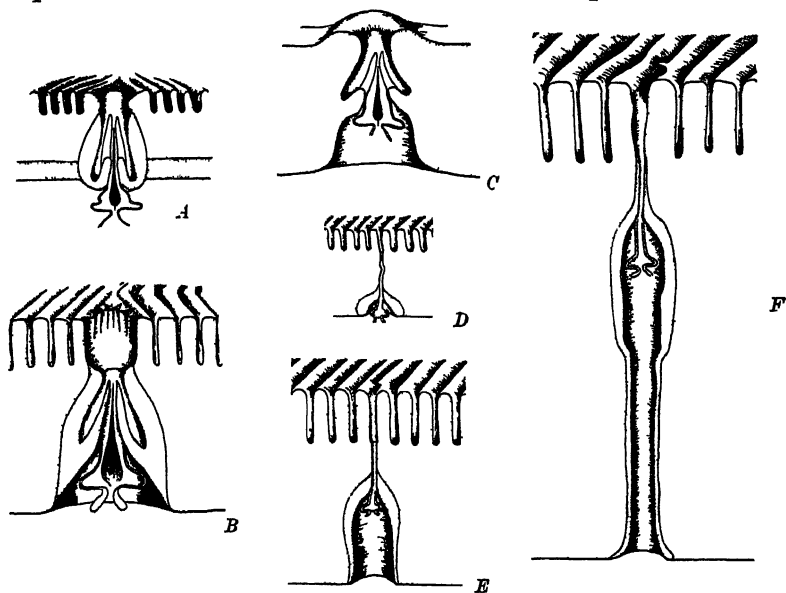
We were able to ascertain that the larvæ are not equipped with peculiar integumentary sense organs. On the contrary we found much the same organs present as in the adults and nymphs. In the larvæ, however, sensilla laterniformia seem to be lacking and the other types of sensilla are to some extent more primitive in development. The organs are distributed over the entire body in fixed numbers and in a definite arrangement.

A detailed account of the three types of sensilla mentioned above follows.

1. Sensilla sagittiformia (arrow-shaped organs)

The sensillum sagittiforme represents a new mode of sensory organ, called by P. Schulze a krobylophore sen-

sory organ, because a tuft-shaped structure is its most striking characteristic. In the adult tick he described this organ as follows in side view (Pl. 1, fig. 2): "The distal portion of the chitinized passage or lumen appears arrow-shaped. Below this lies a narrow pagoda-shaped 'tuft' chamber and farther inside a small, more or less spheroidal 'terminal chamber.' This is separated from



Text-figure 1. A, Sensillum sagittiforme of the opisthosoma of *Rhipicephalus appendiculatus* Neum. B, Same in the larva. C, Same in the nymph. D, Sensillum hastiforme of *Rhipicephalus appendiculatus* Neum. E, Same in the nymph. F, Same in the adult female.

the middle chamber by projecting ledges which leave room only for a small circular opening. The innermost chamber is attached to a simple duct into which the glandular cells extend, enveloping the nerve cells. The surrounding chitin is especially thick beneath the lower portion of the 'arrow points.' The nerve cells decrease in size as they enter the 'terminal chamber.' The axial fiber is attached to a strong scolopale which enlarges to

form a knot and then tapers down, becoming pointed again upon entering the 'pagoda-shaped chamber' in which the 'tuft' is located. This tuft has much the shape of a gas flame and is not chitinized but of a uniform structure, although at times it seems to be somewhat fibrillar."

The larvæ we examined all show, contrary to Delpy's description, four pairs of spiracle-like structures, three of them behind the coxæ, the fourth on the opisthosoma (Pl. 2, figs. 4 and 5). A comparison of their inner structure (Text-fig. 1A-C) with P. Schulze's description and drawings clearly shows that these so-called "larval spiracles" are in reality sensilla sagittiformia. The finer structure of the organ is best seen in the opisthosomal pair of the larvæ of *Rhipicephalus appendiculatus* and *Boophilus calcaratus*. It is pear-shaped and pierces with its conical end the integument on the dorsal face of the fourth festoon. The walls are of thick chitin, the chitinous capsule being 0.012 to 0.016 mm. long and 0.011 to 0.014 mm. broad. A funnel-shaped fold is visible within the capsule. The narrow ends of this capsule, pointing toward the opening, are less strongly chitinized and look in direct view like a pair of lips lying within the capsule (compare Pl. 1, fig. 1). Within these lips lies the tuft-like structure, surrounded by a fine pagoda-like contour.

The sensilla sagittiformia behind the second and third coxæ are very similar in structure to the opisthosomal pair described above. On the other hand, the pair located behind the first coxæ at the edge of the scutum seems to have a strikingly thick-walled capsule which is fully embedded in the chitin of the scutum. It is 0.019 to 0.022 mm. long, 0.016 to 0.022 mm. wide at the base, with the opening 0.011 to 0.014 mm. in diameter. The "tuft" is difficult to recognize here, but is shaped as in the other pairs.

2. Sensilla hastiformia (spear-shaped organs)

The sensilla hastiformia, as described by P. Schulze for the adult ticks, are much smaller than the arrow-

shaped organs. He was unable to make out all the details of the terminal apparatus, but he presumed that they correspond in general to those of the sensilla sagittiformia and that a tuft-shaped structure is also present. The main difference lies, according to Schulze, in the upper portion of the passage leading to the outside. This lacks the long receding arrow-points, so that the "pagoda-shaped chamber," formed by these points, is also missing. The passage is distinctly spear-shaped, in as much as it expands into two mainly horizontal projections at the base.

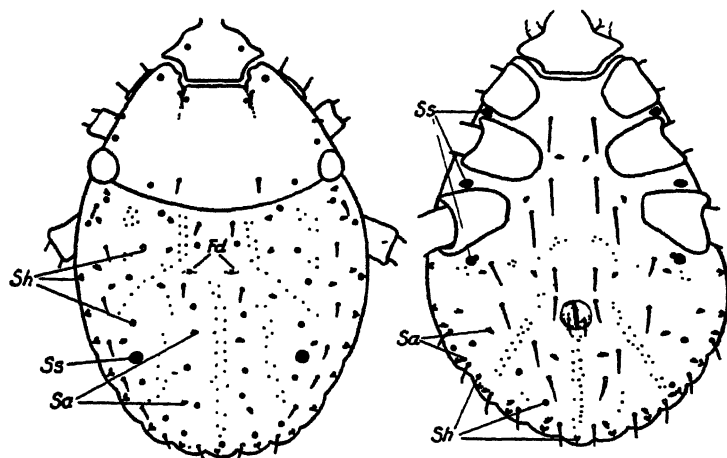
The larval sensillum hastiforme could only be recognized as such after comparing it with the corresponding organ in nymphs and adults (Text-fig. 1, D-F). It lies as a short funnel-shaped structure in the lower part of the integument, which it pierces by means of a narrow passage, ending between the outer folds. The funnel-shaped portion is approximately 0.008 mm. in diameter and 0.005 mm. deep. The walls are about 0.002 mm. thick and the passage is roughly 0.008 mm. long.

We were also unable to recognize the finer structure of the organ, nor could we find anything comparable to a "tuft." In direct view the organ has the appearance of a ring, 0.008 mm. in diameter. Further details cannot be recognized, but by lowering the objective the duct leading inside the body may be followed.

The larvæ of *Rhipicephalus appendiculatus* Neum., *Rh. sanguineus* Latr., *Rh. bursa* Can. and Fanz., and *Rh. evertsi* Neum. studied by us, all have 54 sensilla hastiformia on the body proper; we did not examine the legs. The sensilla are placed strictly symmetrically and neither their position nor their number seem to vary to any extent (Pl. 3, fig. 6). One pair is located on the capitulum, occupying the position taken by the areæ porosæ of the adult female tick. Five pairs are situated on the scutum and nine pairs on the alloscutum, four of these dorsal, one subdorsal and four sublateral. In addition eight pairs are found on the edge of the alloscutum, one sensillum being placed on the edge of each festoon (or parmula), except on the middle festoon. The ar-

rangement of these eight pairs is therefore metameric and seems to be derived from the primitive segmentation of the opisthosoma.

The "foveæ dorsales" of the larva consist of only one sensillum hastiforme each. The integumental folds bend around their openings, whereas on the contrary the openings of the other sensilla hastiformia lose themselves among the folds of the integument. Aside from the fact



Text-figure 2. Arrangement of the integumentary sense organs of the larva of *Hyalomma dromedarii* Koch: Fd, foveæ dorsales; Sa, sensilla auriformia; Sh, sensilla hastiformia; Ss, sensilla sagittiformia.

that the openings are more conspicuous, they do not differ from the usual type of sensilla hastiformia.

Ventrally the body bears four pairs of sensilla hastiformia. One pair lies very close to the sensillum sagittiforme of the third coxa. In *Rh. appendiculatus* it is enclosed by the capsule of the sensillum sagittiforme, so that it is difficult to see. Though closely adjacent to it in the other species, the sensillum hastiforme is nevertheless clearly set off.

The number and the arrangement of the sensilla hastiformia of the larva of *Boophilus calcaratus* Birula (Pl. 3, fig. 7) are similar to those of the *Rhipicephalus*, ex-

cept that we were unable to discover the two foremost pairs on the ventral side and that they seem to be missing also on the fourth and fifth festoons counting from the middle.

The larva of *Hyalomma dromedarii* Koch (Text-fig. 2) possesses more sensilla hastiformia than that of *Rhipicephalus*. It should be mentioned especially that the middle festoon also bears a terminal and a dorsal unpaired sensillum. In addition a sensillum hastiforme is located on the dorsal side adjacent to each of the second, third and fourth festoons. It is noteworthy that two pairs of sensilla hastiformia, instead of one pair, were found on the capitulum of one specimen in the position of the areæ porosæ of the adult female.

3. Sensilla auriformia (ear-shaped organs)

The sensilla auriformia discovered by P. Schulze (1942a) in adult ticks may be traced back with certainty to setæ or hairs. They are located directly under the cuticula and consist each of a flat disk, usually inclined a little toward one side, so that it closes outwardly the sensory duct ascending from below, like a lid with overlapping edges (Pl. 1, fig. 3). The disks vary in details and have the shape of an ear, a megaphone or a bell. Their openings face various directions, so that it is possible to see one sensillum in direct view and the other in side view when examining two of them placed close together.

The larval ticks also possess these sensilla in typical form, but the organs are smaller than in the adult. The disk is approximately 0.009 mm. in diameter. Arrangement and number again seem to be strictly uniform, but all the disks lean in one particular direction.

Ten pairs of sensilla auriformia were found on the alloscutum of all larvae of *Rhipicephalus* examined. Five pairs may be seen dorsally some distance from the median line and five pairs on the edge of the alloscutum. Neither capitulum nor scutum seem to have any. Twelve pairs are located on the ventral side, two of them be-

tween the coxæ, the remainder on the opisthosoma, five of the latter in the festoons.

The same number of sensilla auriformia is found in the larvæ of *Hyalomma dromedarii* Koch (Text-fig. 2) as in *Rhipicephalus* and their arrangement is similar. In the larva of *Boophilus calcaratus* Birula (Pl. 3, fig. 7) the pair behind the third coxæ and the first pair on the edge are missing, but the remaining sensilla auriformia are as in the larva of *Rhipicephalus*.

SUMMARY

The larvæ of the Rhipicephalinæ do not possess peculiar integumentary sense organs, as K. W. Neumann (1942) believed, but rather the same types found in the nymphs and adults. The organs are merely in a more primitive state of development and the sensilla laterniformia appear to be missing. Sensilla sagittiformia, sensilla hastiformia and sensilla auriformia may be demonstrated. These organs are strictly specific in number and arrangement within the genera *Rhipicephalus*, *Hyalomma* and *Boophilus*.

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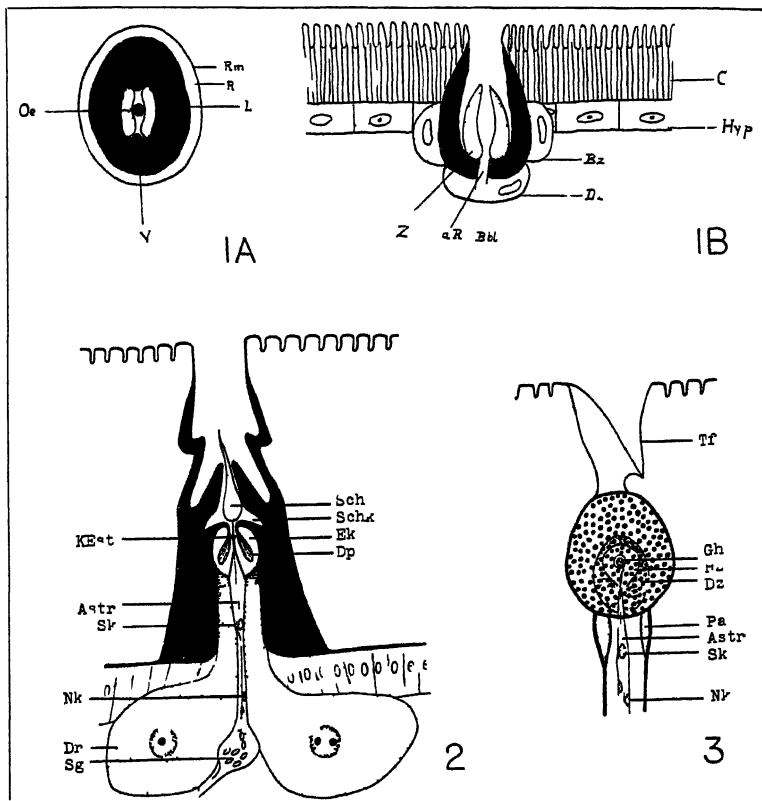
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EXPLANATION OF PLATE 1

- Fig. 1. Larval integumentary sense organ of *Haemaphysalis punctata* Can. and Fanz., redrawn from K. W. Neumann (1942). A, in direct view; B, in side view: aR, sensory duct; Bbl, internal vesicle; Bz, generative cell; C, cuticula; Dz, gland cell; Hyp, hypodermis; L, lips; Oe, mouth of the sensory duct; R, frame; Rm, fringe; V, protrusions of the frame; Z, tooth.
- Fig. 2. Schematic drawing of a sensillum sagittiforme of *Hyalomma*, after P. Schulze: Astr, axial fiber; Dp, projecting ledges; Dr, gland cell; Ek, terminal chamber; KEst, knot of the scolopale; NK, enveloping cell nucleus; Sch, tuft; Schk, tuft chamber; Sg, sensory cell group outside the duct. The chitinous structure surrounding the sense organ has been omitted.
- Fig. 3. Schematic drawing of a sensillum auriforme on the allosecutum of a female *Hyalomma*, after P. Schulze: Astr, axial fiber; Dz, shaded zone of the disk; Gh, papilla with terminal apparatus in central area of the disk; Hz, unshaded zone; Nk, enveloping cell nucleus; Pa, pigmented and thickened section of the duct; Sk, sensory cell nucleus; Tf, supporting plicature. The chitinous structure surrounding the sensory organ and gland cells has been omitted. The disk covering the sensory cell and the terminal apparatus is assumed to be transparent.

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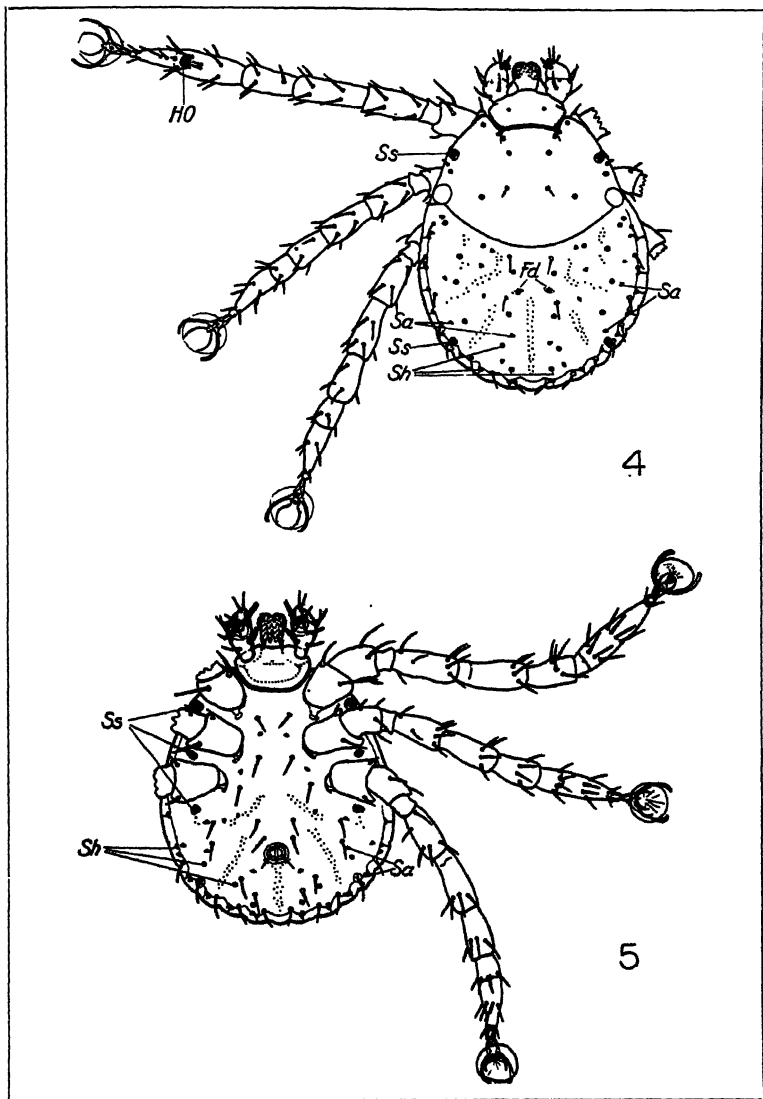
VOL 56, PLATE 1



DINNICK AND ZUMPT—RHIPICEPHALINÆ

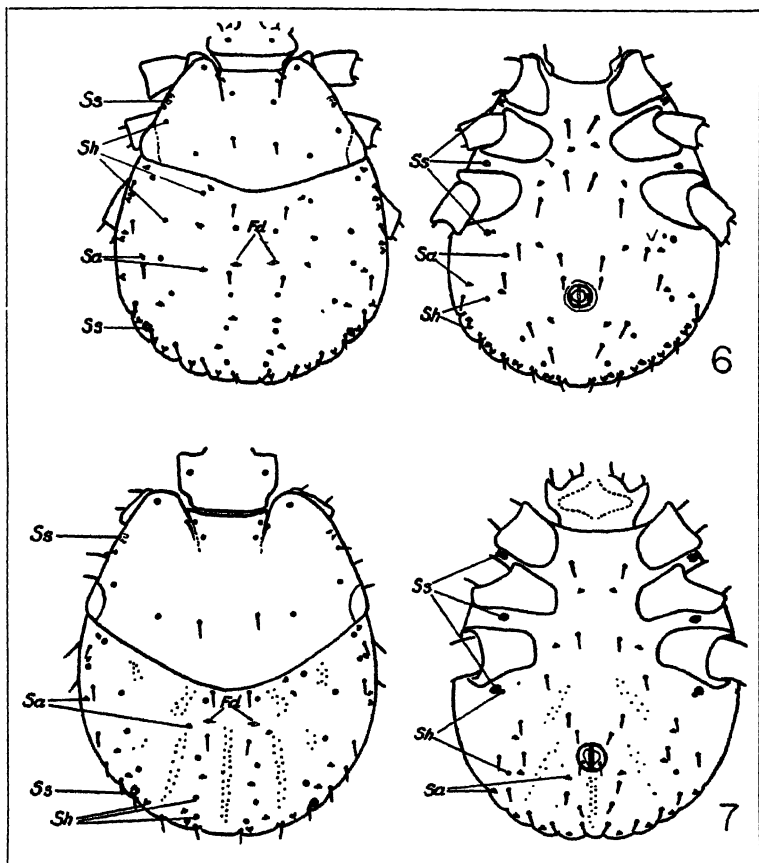
EXPLANATION OF PLATE 2

- Fig. 4. Dorsal view of larva of *Rhipicephalus appendiculatus* Neum., showing sensory organs: Fd, foveæ dorsales; HO, Haller's organ; Sa, sensilla auriformia; Sh, sensilla hastiformia; Ss, sensilla sagittiformia.
- Fig. 5. Ventral view of larva of *Rhipicephalus appendiculatus* Neum., showing sensory organs: Sa, sensilla auriformia; Sh, sensilla hastiformia; Ss, sensilla sagittiformia.



EXPLANATION OF PLATE 3

- Fig. 6. Arrangement of the integumentary sense organs of the larva of *Rhipicephalus sanguineus* Latr.: Fd, foveæ dorsales; Sa, sensilla auriformia; Sh, sensilla hastiformia; Ss, sensilla sagittiformia.
- Fig. 7. Arrangement of the integumentary sense organs of the larva of *Boophilus calcaratus* Birula: Fd, foveæ dorsales; Sa, sensilla auriformia; Sh, sensilla hastiformia; Ss, sensilla sagittiformia.



ON THE STATUS OF *CRYPTOCERUS* LATREILLE
AND *CEPHALOTES* LATREILLE (HYMEN-
OPTERA: FORMICIDÆ)

BY MARION R. SMITH

Bureau of Entomology and Plant Quarantine, Agricul-
tural Research Administration, United States
Department of Agriculture

Latreille, in Hist. Nat. Crust. and Ins., volume 3, 1802, included in the family "Formicaires" two genera, *Formica* Linnaeus and the new genus *Cephalotes*. *Cephalotes* was monobasic with *Formica atrata* Linnaeus the only included species (pp. 357-358). In volume 5, 1803, he again placed in "Formicaires" only the two genera but to the group which he had called *Cephalotes* in 1802 he gave the name *Cryptocerus* (p. 311). Distinguishing characters were given but no species were mentioned by name.

Fabricius, 1804, Systema Piezatorum, page 418, used the name *Cryptocerus* for *atratus* Linnaeus and 4 new species, including *umbraculatus*; and he cited *Cephalotes* Latreille in synonymy under *Cryptocerus atratus*.

In 1810, Latreille (Consid. Gen. Crust. Arachn. Ins., p. 437) designated *atratus* Fabricius (= *atratus* Linnaeus) as the type of *Cryptocerus*. Since *atratus* was available for type designation of *Cryptocerus*, this action by Latreille has fixed the matter beyond dispute. *Cryptocerus* Latreille is thus an isogenotypic synonym of *Cephalotes* Latreille. The interpretation of *Cryptocerus* by subsequent authors who considered *umbraculatus* Fabricius as its type is erroneous, and a new generic name is needed for *Cryptocerus* of Emery (1915) and authors, not Latreille.

On page 253 of his 1805 work Latreille says "Toutes les espèces de cryptocérès, dont la fourmi *atrata* de Lin. et de Fab. est une, sont exotiques. Ces insectes ont un caractère très remarquable, et qu'on ne trouve à aucun de cet ordre; c'est le premier article de leurs antennes qui est inséré et logé de chaque côté, dans une rainure

latérale de la tête." In the original description of *Cephalotes* he writes "Premier article des antennes inséré et logé, de chaque côté, dans une rainure latérale de la tête," and in the original description of *Cryptocerus*—"Premier article des antennes s'insérant dans une rainure de la tête." It seems obvious that Latreille considered *Cryptocerus* (hidden or concealed horn [antenna]) much more descriptive of the genus *Cephalotes* (having a head) and decided to use it instead.

Since the facts in this case are as just stated, the tribe receives the new name, *Cephalotini*, based on the type genus *Cephalotes*, which must be used for *Cryptocerus* of authors. The genera and subgenera involved, with synonymy and types, are as follows:

Genus *Cephalotes* Latreille

Cephalotes Latreille, 1802, Hist. Nat. Crust. and Ins. 3: 357.

Type: *Formica atrata* Linnaeus. Monobasic.

Syn.: *Cryptocerus* Latreille, 1803, Hist. Nat. Crust. and Ins. 5: 311.

Type *Formica atrata* Linnaeus. Designated by Latreille, 1810.

Syn.: *Cryptocerus* Fabricius, 1804, Systema Piezatorum, p. 418 (in part).

Emery, 1915, Bul. Soc. Ent. de France, p. 192 divided *Cryptocerus* into three subgenera: *Paracryptocerus*, n. subgen., type *Cryptocerus spinosus* Mayr; *Cryptocerus*, type *C. umbraculatus* Fabricius, and *Cyathcephalus*, n. subgen., type *Cryptocerus pallens* Klug. Except for *Cryptocerus* he listed additional species in each subgenus. In 1922, in Wytsman's Genera Insectorum, fascicule 174c, pp. 306, 308, he gave a detailed description of each of the above subgenera, cited the same types and listed all the known species.

Since *Cryptocerus* is not available, *Paracryptocerus* will succeed it. The correct arrangement is as follows:

Genus *Paracryptocerus* Emery,
subgenus *Paracryptocerus* Emery

Paracryptocerus Emery, 1915, Bul. Soc. Ent. de France,
p. 192.

Type: *Cryptocerus spinosus* Mayr. By original
designation.

Genus *Paracryptocerus* Emery,
subgenus **Harnedia**, new subgenus

Harnedia is proposed for *Cryptocerus* of Emery, 1915,
and subsequent authors, not of Latreille. Its type is
umbraculatus Fabricius (1804). In 1922, Emery char-
acterized the group and listed all the known species.
The name *Harnedia* is in honor of Mr. R. W. Harned
from whom I have received much encouragement in my
studies of ants.

The following descriptions of the soldier and worker
of this new subgenus are substantially the same as given
by Emery in 1922.

Soldier.—Head usually longer than wide, occasionally
similar to that of *Paracryptocerus* Emery except that the
head is longer and less convex above. Tubercles near
the posterior border of the head usually connected by a
transverse ridge which unites with the lateral borders of
the head forming a surface within these borders known
as a cephalic disk; anterior border of cephalic disk with
a median gap which exposes the mandibles and clypeus.

Thorax very noticeably more robust than that of the
worker and without foliaceous border as in that caste.
Epinotum with more or less distinct spines; exceptionally
(*umbraculatus* Fabricius), the posterior spines of the
epinotum are the longest.

Worker.—Thoracic border of variable form, some-
times spined or toothed as in *Paracryptocerus* Emery but
the posterior pair of the 2 or 3 pairs of teeth on the epi-
notum never the longest. Border of thorax sometimes

divided into 3 parts to correspond to its segments, more or less widely margined, translucent or foliaceous, and without teeth.

Genus *Paracryptocerus* Emery,
subgenus *Cyathomyrmex* Creighton

Cyathocephalus Emery, 1915, Bul. Soc. Ent. de France,
p. 192. Preoccupied by Kessler, 1868.

Type: *Cryptocerus pallens* Klug. By original designation.

Cyathomyrmex Creighton, 1933, Psyche 40: 98. New name.

STRUMIGENYS VENATRIX WESSON AND WESSON SYNONYMOUS WITH *S. TALPA* WEBER.—In the course of his studies of dacetine ants, Mr. William L. Brown, Jr. secured a loan of the type of *S. talpa* Weber (1934, Psyche, 41: 63–65, fig. 1) from the collections of the Illinois Natural History Survey. This specimen he very kindly placed at my disposal, since I had not seen it during earlier studies on *Strumigenys* in Ohio (Wesson and Wesson, 1939, Psyche, 46: 91–112, Pl. 3). The type of *talpa* proves to be indistinguishable from paratypes of *S. venatrix* which I had described from southern Ohio, and the latter name should be dropped.

According to Brown's recent revision of the dacetine genera, *S. talpa* should be transferred from the genus *Strumigenys* Fred. Smith to the genus *Smithistruma* Brown (1948, Trans. Amer. Ent. Soc. 74: 101–129, 2 figs.).

—LAURENCE G. WESSON, JR., Department of Physiology,
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THE MALE OF *PRODIDOMUS RUFUS* HENTZ (*PRODIDOMIDÆ*, *ARANEÆ*)¹

BY ELIZABETH B. BRYANT

Museum of Comparative Zoology

More than a century ago, in 1847, Nicholas M. Hentz, one of the first students of American spiders, found a spider in a box in a dark cellar in Alabama; it had such unusual characters that he erected a new genus and species for it. Both the generic and specific descriptions are brief, but because of the unusual arrangement of the eyes, the genus has been recognized and twenty-four species from all the warm parts of the world have been placed in it. But the genotype specimen has disappeared and the species has long evaded collectors. In 1892, Mr. N. Banks found a few immature specimens under paper in a house in Shreveport, Louisiana, and published a short description of them. These records have been the only accounts of the American species until 1936, when an adult female was found by Miss Sarah Jones under a stone by the road-side near Dallas, Texas. This I described a few months later. Recently, when looking over some spiders in the Jones Collection, now at the Museum of Comparative Zoology, an adult male was found. This specimen was collected in a house at Denton, Texas, the 4th of December 1946, and is here described as the allotype.

Prodidomus rufus Hentz

Prodidomus rufus Hentz, Jour. Boston Soc. Nat. Hist., 1847, 5: 466, pl. 30, fig. 4; reprint, 1875, p. 105, pl. 12, fig. 4, pl. 18, fig. 9.

Male. Length, 3.0 mm., cephal. 1.7 mm. long, 1.4 mm. wide, abd. 1.5 mm. long, 1.0 mm. wide, palpus, 1.9 mm. long.

Cephalothorax pale yellow, smooth and shining, slightly convex, highest between the second coxæ, no thoracic

¹ Published with a grant from the Museum of Comparative Zoology at Harvard College.

groove or radial furrows, anterior margin broad and slightly rounded, sides rounded, posterior margin slightly less than the anterior; *eyes* eight, anterior row straight by the upper margins, eyes equidistant, a.m.e. largest of the eight, dark, round and convex, separated by about a line, a.l.e. white, convex and round, little more than a radius of the a.m.e., posterior row strongly procurved, the same length as the anterior, eyes white and flat, p.m.e. elliptical, separated by more than the long diameter, p.l.e.

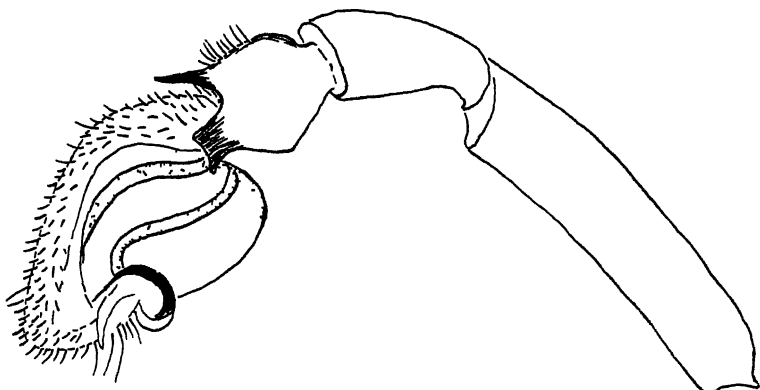


Fig. 1. *Prodidomus rufus* Hentz, left palp.

elliptical, but the long axis at right angles to the p.m.e.; eyes much closer together than in the female; *quadrangle* narrower in front than behind, and higher than wide; *clypeus* below the a.m.e. about a radius of a.m.e., no hairs or bristles on the margin as in the female; *mandibles* yellow, basal third swollen, only slightly divergent, fang groove oblique, no teeth on either margin, fang long and very slender, with the base not enlarged; *labium*, a dull brown, septum distinct between the sternum, slightly wider than long, tip not rebordered; *maxillæ* about twice as long as the labium, tips inclined and almost touching, pointed, basal third very wide, origin of the palpus at the basal third; *sternum* pale, oval, four-fifths as wide as long, flat, with no hairs, ending in a point between the fourth coxæ; *abdomen* oval, and depressed, a deep red,

covered with short white hairs, posterior third with no hairs and many transverse wrinkles, venter pale, spinnerets pale and smaller than in the female; *legs*, 4-1-2-3, pale, coxæ and trochanters very long, and can be seen from the dorsal side, smooth, I femur with a ventral brush of short colorless hairs, no spines, I coxæ the longest, about twice as long as wide, trochanter a little shorter and more slender, IV coxæ and trochanter subequal, and together as long as the femur, a pair of colorless ventral spines at the distal end of the IV tibia, no trichobothria at the tip of the IV metatarsus and tarsus as in the female; *palpus*, longer than the cephalothorax, femur more than half the length, pale, patella pale and slender, twice as long as wide, tibia darker, little more than half as long as the patella, tibial apophysis a slender dark dorsal spur and a broad dark lateral spur with a truncate tip, as figured, the palpal organ nearly as long as the cymbium, bulb strongly convex, pale and extending onto the tibia, the tube dark and very distinct, embolus a dark spiral coil, with the tip resting near a triangular paler point.

Allotype (♂) Texas; Denton, 4 December 1946, (Jones)

The allotype male and the neotype female were found in quite different habitats, the female out of doors, and the male in a house and they do not agree in all characters. The female is larger, pale, and only tinged with red, on the margin of the clypeus there is a fringe of hairs, and on the fourth metatarsus and tarsus are some distinct trichobothria. The male is smaller, the abdomen a deep red, covered with white hairs, the eyes are more closely grouped, the first femur has a brush of ventral hairs and the trichobothria on the fourth leg are lacking. The difference in color may be due to the habitat and the other differences are probably sexual.

In 1918-19, Dalmas published an excellent revision of the family *Prodidomidæ*, which by then included five genera, all with the same arrangement of eyes and similar spinnerets. The genotype, *Prodidomus rufus*, he knew only from the description of the immature specimens by Banks. Dalmas suggests that the Old World

species placed in the genus *Prodidomus* might not belong there. In his diagnosis of the genus, he stresses two characters that are not found in the genotype. All the Old World species have the anterior median eyes the smallest of the eight, and the fourth trochanter longest, often longer than the fourth femur. This is not found in *P. rufus*. The other species from America, *P. nigri-cauda* Simon, 1892, and *P. opacithorax* Simon, 1892, both from Venezuela, are described with the eyes of the anterior row subequal. If the Old World species are separated from the American, the genus *Miltia*, Simon, 1870, is available as it was established for the species *Emyo amaranthius* Lucas, 1846, from Egypt. This species has the anterior median eyes the smallest of the eight, and the fourth trochanter is the longest.

In the Dalmas revision, twenty-three species of the genus *Prodidomus* have been recognized. These are found in the warm parts of the world, but only five species are known by both sexes.

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SOME FLIES OF THE GENUS *VOLUCELLA* FROM THE NEW WORLD

By F. M. HULL

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Recent studies of American Syrphid flies have disclosed a number of species of *Volucella* which appear to be undescribed. This paper presents the descriptions of these species. The types are in the author's collection.

Volucella splendens n. sp.

This bright purplish to bluish species is related to *macula* Wiedemann. It is distinguished by the general color of the abdomen and the rusty orange red face with conspicuous lateral flattened areas on either side of the tubercle. Length 14 mm.

Male. *Head*: the face, cheeks and the front, except for a small brown triangular callus, are entirely pale rusty orange in color. The facial tubercle is large and elongate, more abrupt below, with a patch of blackish pile in the middle and the remainder of the facial pile red. The frontal pile is reddish in the middle and the sides but with some black pile in the junction of the eyes. Antennæ light brownish orange, the third segment elongate, narrow upon a little more than the apical half and this apical portion with parallel sides in the male. Eyes holoptic for a long distance, flattened above with the upper facets greatly enlarged and the ocular pile dense and long and pale brownish yellow. Vertical pile black. The pollen of the face is restricted to the upper portion beneath the antennæ and is distinctly pale brownish yellow. The sides of the upper portion of the face on either side of the tubercle are distinctly flattened leaving a rather sharp ridge laterally and a corresponding well marked crease beside the tubercle; the intervening area is flattened. *Thorax*: the mesonotum is shining black, becoming diffusely brown on the notopleura, the humeri, the intervening area, the margin above the wing and the

post calli. This marginal color is moderately light brown; the mesopleura, pteropleura and upper metapleura, are similarly brown, but ventrally the pleura becomes blackish. There are some bluish reflections upon the posterior half of the mesonotum in the middle and a pair of faint sub-lateral shining coppery vittæ. The mesonotal pile is chiefly black with five longitudinal stripes of shorter yellow pile which are restricted to the anterior half of the mesonotum and are best seen in the posterior view. The bristles of the thorax and scutellum are black; the mesopleura with one bristle, the bulbous notopleura with four, the post calli with six, the supraalæ region with three, the prescutellar region with eleven, the scutellar margin with fourteen, all of which are strong and more or less tuberculate. The scutellum is somewhat flattened and concave before the apex but without definite crease. The color of the scutellum is dark brown, over the disc which is also microgranulate, the base of the scutellum and the margin hyaline yellowish brown. Scutellum upon the disc with purplish reflections and the disc with very fine black hairs, rather long, which seem to proceed from the granulations but these hairs are scarce and scattered in all of my specimens whereas the granulations are very dense. Squamæ dark brown with brown fringe and border. *Legs*: the femora are dark reddish brown, the anterior pair and middle pair becoming lighter in color on the apical half. The hind pair are almost black especially on the dorsal margin. All of the tibiæ light coffee brown, the hind tibiæ somewhat darker and with a suggestion of a blackish brown post medial band. First three segments of anterior and middle tarsi light reddish brown, the remaining ones black. Hind tarsi similarly colored but the color a little dark. Pile of legs black. Ventral tarsal mats blackish and upon the hind pair deep reddish sepia. *Wings*: with a large, quadrate, dark sepia brown spot in the middle of the anterior half, the costal and the first basal cells, the subcostal cell brownish yellow. Marginal cell closed with a short stalk. *Abdomen*: first segment black, the remaining segments brilliant metallic blue with traces of purple reflections in the mid-

dle and very faint traces of green mixed in the blue along the lateral margins. Abdominal pile entirely black except upon the first segment and narrowly along the base of the second where it is yellowish. Sternites metallic bluish black; not so brilliant as the tergites. The pile chiefly yellow becoming black beyond the middle of the third sternite.

Female. Similar to the male in every respect with the front entirely light reddish chestnut brown divided down the middle with faint linear impressions. The pile of the eyes is more sparse but is of the same color as in the male. Third antennal segment slightly concave in the middle above, the apical portion not with parallel sides. Arista pale yellow with about twenty-five long rays.

Holotype: male, allotype female and one paratype female from Nova Teutonia, Brazil, collected by Fritz Plaumann, Jan.-April 1948.

This species traces to *macula* Wiedemann or to *panamena* Curran in Curran's key.

Volucella liriopae n. sp.

A small species related to *macula* Wiedemann and *obliquicornis* Curran, the tibia are entirely reddish and the abdomen beyond the first segment is entirely black. There is a large brown spot upon the wings. Length 7 mm.

Male. Head: the face, cheeks and front are light yellowish brown. The tubercle is low with a patch of stiff black hairs in the middle; face otherwise with a few scattered yellow hairs and sparse yellow pollen beneath the antennæ. The frontal callus is dark brown, the frontal pile and the vertical pile black. The antennæ are elongate and entirely light brownish orange with the arista yellowish on the basal half but darker apically and with about twenty-one long rays. The eyes have the upper facets somewhat enlarged but not flattened; the ocular pile is light brownish to reddish yellow and quite thick upon the upper half. *Thorax:* mesonotum with opalescent strong greenish reflections and a coppery reflection where the light strikes. The sides of the mesonotum and the anterior margin and the upper part of the pleura are light

reddish or yellowish brown in color. The mesonotal pile is black with a few pale hairs behind the humeri. The humeri are pale yellow. All pleural pile black. The bristles of the thorax and scutellum are black; there is one bristle upon the mesopleura, three on the notopleura, three above wing, three upon the post calli, six in front of the scutellum and six upon the scutellar margin. The scutellum is dark brown in color, the disc subopaque without posterior depression; the disc also has bluish to coppery reflections and is apparently devoid of pile, although fine granulations suggest that there may have been pile. There are also a few slender black hairs on each basolateral margin. Squamæ brown with dark brown border and fringe. *Legs*: the femora are brown, the hind pair quite dark, the anterior pair somewhat yellowish brown. Anterior and middle tibiæ brown, the hind pair deep sepia. First three segments of all of the tarsi rather light brownish yellow but black pilose, the mat pile on the hind tarsi light reddish yellow; terminal segments of tarsi blackish. *Wings*: distinctly greyish hyaline with a prominent, large, quadrate, sepia brown spot in the middle anteriorly; the remainder of the first basal cell is also blackish except at the base and except just in front of the large brown spot. The posterior cross-veins and the margin of the anal vein are blackish; the stigmal cell is yellow beyond the quadrate brown blotch then becomes blackish for a short distance and beyond this for nearly half of its length the stigmal cell is light brownish grey. Marginal cell closed with a rather long stalk. *Abdomen*: first segment is dark sepia brown, more or less shining; the remaining segments are black with strong opalescent bluish reflections; there is a faint brassy cast where the light strikes them.

Female. Similar to the male; the front is shining light coffee brown on the lower half becoming opalescent blackish on the upper half. There is a medial, linear impression on the upper half of the front and in the middle of the front the slightly raised portion is longitudinally striate with some of the striæ curved.

Holotype: male, allotype, female, Nova Teutonia, Brazil, Jan. to April 1948, collected by Fritz Plaumann.

Volucella impressa n. sp.

This species is related to *pinkusi* Curran and *aster* Curran but is easily distinguished by the wholly black abdomen besides other differences. There is a diffuse brown tinge in the middle of the wing, and a narrow brown stripe between the face and cheeks. Length 10 mm.

Male. *Head*: the face, except the region beneath the antennæ, and cheeks, except the posterior part, light coffee brown in color without any medial black stripe. There is, however, a slender brown stripe from the eye margin to the epistoma. The lower face is somewhat conical and slender. The low tubercle is thickly black pilose, the pile upon the sides of the face reddish yellow. Beneath the antennæ the face is blackish with pale yellow pollen which continues thinly but widely down to the epistoma. The front is sepia brown becoming black near the junction of the eyes with thin, pale brownish yellow pollen. The frontal and vertical pile is black. The eyes are not flattened, the upper facets scarcely enlarged, the ocular pile dense and sepia brown in color, not black. The antennæ are reddish brown throughout, the third segment more narrow on the apical half; the arista is yellowish basally, blackish apically, with about seventeen rather short rays. *Thorax*: the mesonotum and scutellum, except for the humeri and post calli, are entirely black with strong greenish to bluish opalescent color and coppery reflection where the light strikes. The humeri and post calli are light brownish yellow. The mesonotal, pleural and scutellar pile is black and rather dense and fine except for four longitudinal stripes of nearly white pile on the mesonotum which is most readily seen in posterior view. These stripes of pile extend fully three-fourths the length of the mesonotum with the outer pair wider. There are a very few pale hairs at the extreme base of the scutellum, but its ventral fringe is black. The bristles of the thorax are black; there is one bristle upon the mesopleura, three on the notopleura, three above wing, three on the post calli, none in front of the scutellum and ten upon the margin of the scutellum. The scutellum is concolorous with the mesonotum with a very deep, trans-

verse, preapical depression extending the entire apical width of the scutellum. The squamæ are pale brown, the outer border, the margin and the fringe very dark sepia brown. *Legs*: black, only the extreme base of the anterior and middle tibiæ and the extreme apex of their femora yellowish brown. Pile of legs black, the ventral mat of the hind tarsi very nearly black but actually reddish sepia in the middle. *Wings*: pale brownish hyaline with more distinct but diffuse yellowish brown tinge in the middle of the wing in the whole of the stigmal portion of the subcostal cell and in the outer half of the costal cell. Marginal cell widely open. *Abdomen*: the first segment is shining black, the remaining segments black and shining with very strong opalescent greenish color and coppery reflection where the light strikes them. Hypopygium black. Sternites shining black with less conspicuous opalescent reflections. The pile of the first and second sternites widely white through the middle with a few black hairs laterally. Third and fourth sternites with more restricted white pile in the middle.

Female. Similar to the male, the front shining black throughout except upon the preantennal callus which is narrowly reddish. Frontal and vertical pile of the female black. Pile of the abdomen broadly whitish on the basal portion of the second, third and fourth segments, becoming black narrowly on the posterior border of the second segment, black upon the posterior half of the third segment and the posterior half of the fourth segment except in the posterior corners.

Holotype: male, allotype, female, one paratype female, Nova Teutonia, Brazil, collected by Fritz Plaumann, Jan.-Apr., 1948.

Volucella tripunctata n. sp.

A small species characterized by the three brown spots in the middle of the wing, the broad yellow translucent base to the abdomen. Related to *fracta* Curran. Length 7.5 mm.

Male. *Head*: face and the anterior half of the cheeks light yellowish brown. There is an indistinct medial

stripe upon the face which is blackish, a distinct wide stripe from eye margin to epistoma and the posterior half of the cheeks are black. Face with yellowish white pile and the yellow pollen is restricted to the area below the antennæ. The front is black with only a little pollen along the eye margins; its pile is yellowish. The pile of the vertex is black. The eyes are not flattened but the upper facets are considerably enlarged and thickly dark reddish brown pilose; the pile extends more thinly almost to the bottom of the eye. The antennæ are light brown, the arista yellowish but black apically with about fifteen short rays. *Thorax*: the mesonotum and scutellum are shining black, the former with rather distinct purplish reflections which are not opalescent. The scutellum is slightly opalescent in reflection with a strong, complete, transverse, preapical depression which is microgranulate. The post calli and humeri are light brown; pleura black and black pilose. The mesonotal pile and scutellar pile black but with some scattered shorter yellow pile on the mesonotum which extends almost to the scutellum and is not arranged in rows. The bristles of the thorax are black; there is one bristle on the mesopleura, two on the notopleura, three above the wing, two upon the post calli, none in front of the scutellum and eight upon the scutellar margin. Squamæ very dark sepia throughout. *Legs*: the femora are black becoming obscurely dark reddish brown near the apex; the tibiæ are black, very narrowly reddish sepia at the base of the first and second pairs. Anterior tarsi black, their basitarsi brown upon the sides. Middle tarsi black with the basitarsi brown. First two segments of hind tarsi rather light reddish brown, the remaining segments black. Pile of legs black, reddish however, beneath the hind tarsi. *Wings*: very strongly tinged with yellowish brown especially upon the anterior half from which it fades and becomes paler and less yellowish posteriorly. The whole stigmal cell is rather deep brownish yellow beyond the end of the costal cell and with a slightly darker brown spot across this cell at the end of the costa. There are deep, distinct, small brownish spots on the anterior cross vein, the base of the

third vein and at the base of the discal and third posterior cells. Marginal cell closed in the costa. *Abdomen*: first segment and a little more than the basal half of the second segment light yellowish and translucent. The translucent area laterally extends almost to the posterior corners but is narrowly divided in the middle by a medial blackish vitta which reaches nearly to the base of the second segment; the remainder of the second and the whole of the third and fourth segments are shining black. The pile is yellow upon the yellow areas of the first segments, widely yellow on the third segment, except immediately along the posterior margin, and yellow upon the fourth segment. Second sternite and narrow base of the third light translucent yellowish; sternal pile yellowish white.

Female. Similar to the male, the front black and shining with pale yellow pile. The marginal cell rather widely open.

Holotype: male, allotype, female and one paratype female, Nova Teutonia, Brazil, Jan. to April 1948, collected by Fritz Plaumann.

Volucella palmyra n. sp.

A small species related to *zephyrea* Curran but distinguished by the yellow pilose pleura and the entirely black front tarsi. Moreover, the entire hind tibiae are unicolorous brownish black, not half brown. The depression of the scutellum is very shallow and oval. Length 6 mm.

Female. *Head*: the face is rather deeply conical, the tubercle moderate but the face very deeply excavated above. The face and cheeks are pale yellowish brown with a faint trace of a slender brown stripe from epistoma to eye margin. The facial pile is sparse and short and yellow, the yellow pollen restricted to the area beneath the antennae. The front is shining black with only the area about the preantennal callus reddish brown. The pile of the front and ocellar region is sparse, short and yellow, the upper occipital pile behind the ocelli black. Eyes with sparse, short yellowish white pile.

The antennæ are light brownish orange, the third segment rather short but broad on the basal half and narrowing but little apically; the dorsal margin is flat and straight except at the base and apex. Arista yellow, black at the apex, with about fifteen rays. *Thorax*: the mesonotum is very dark sepia brown across the middle with strong bluish to purplish reflection; the blue color is arranged in faint obscure stripes. The sides of the mesonotum, the anterior margin and the post calli are light brown. The upper half of the pleura is lighter and more yellowish brown. Pleural pile brownish to reddish yellow. The mesonotal pile is short and sparse; from posterior view it appears to be chiefly light yellow with some brownish or black pile intermixed, especially in front of the scutellum; from anterior view this pile appears to be almost entirely brown to black. The bristles of the thorax are black; there is one upon the mesopleura, two upon the notopleura, three above wing, two on post calli, none in front of scutellum and six upon the scutellum margin. The scutellum is brown; it is somewhat paler down the middle and in the basal corners but with baso-lateral flattened granulate areas which show a blue reflection and which areas are not longer than wide. Beyond these flattened areas on either side the scutellum has a purplish reflection. The preapical depression is large, quite short oval, and extremely shallow and granulate. Squamæ pale brown with rather darker reddish brown fringe. *Legs*: the femora are blackish becoming yellowish to reddish brown apically. All of the tibiæ are extremely dark sepia brown and almost black throughout. Anterior tarsi black; the middle basitarsi dark brown, the remainder of the segments black. Hind basitarsi rather light reddish brown, the remaining segments black. The pile of the legs is black. *Wings*: tinged with brown which is faintly yellowish; the brown tinge is a little darker on the apical half. There is a large quadrate brown spot restricted to the subcostal cell at the end of and including the tip of the costal cell.

The marginal cell is widely open. *Abdomen*: the first

segment is dark brown, the second shining black with a pair of diffusely margined yellow triangles on the base of the segment which are subtranslucent and divided in the middle by a diffuse blackish vitta. Third and fourth segments extremely dark sepia but appearing chiefly blackish especially in the middle. The pile of the second, third and fourth segments is abundant, very fine and actually entirely very pale yellowish white; in some lights it appears to be blackish.

Holotype: female, Nova Teutonia, Brazil, Fritz Plau-mann; Jan.-Apr., 1948.

Volucella nigropoda n. sp.

A yellow and black species. Related to *correcta* Curran, the legs are quite black instead of reddish. More than three-fourths of the mesonotum is black with a purplish reflection. Length 7 mm.

Male. *Head*: the face and the posterior portion of the cheeks and the front are pale yellow. The face has a brownish black middle stripe becoming evanescent between the tubercle and the antennæ. There is a very wide polished black stripe from the lower eye margin to the epistoma. The pile of the front and face is pale yellow; the antennæ are pale brownish orange. The arista are pale, becoming dark only at the extreme tip; it has seventeen rays. The eyes are widely touching, the upper facets only slightly enlarged; the upper ocular pile is very dense, longer than that on the lower half and nearly black in color. This upper pile becomes thinner dorsally and posteriorly beyond the area of the enlarged facets. The lower ocular pile appears to be reddish to yellowish brown. Vertex black with a few black hairs. The eye facets extend to the posterior rim of the head upon the upper one-fourth; the occiput which is yellowish or greyish white pollinose stops at this point. Pile of the occiput very short, sparse and pale yellow. *Thorax*: the mesonotum is widely shining black with an opalescent bluish and strong coppery or purple reflection. The lateral margins are broadly pale yellow but the black medial area is considerably wider than the scutellum and occu-

pics at least three-fifths the width of the mesonotum. The humeri are pale yellow. The scutellum is translucent, light brownish yellow without preapical depression but with a linear marginal crease or furrow running from close to the base on either side around the margin of the dorsal edge of the scutellum. The scutellum has some thirty or more fine long discal black hairs and more numerous but sparse short black hairs together with five pairs of long, slender black bristles on the margin. Mesonotum with two black notopleurals, two supra-alars and two post callar and one mesopleural bristle which are all black. Pleura pale yellow on propleura, pteropleura, metapleura, upper hypopleura and narrowly on the upper sternopleura. Remainder of pleura brownish black. Pleural pile pale yellow. Squamæ translucent greyish with sepia border and fringe, the halteres yellowish white. *Legs*: almost black; actually of a very dark blackish sepia color. The base of the anterior and middle tibiae are a little paler in color but the difference in shade is not readily noticeable. This is also true of the base of all the basitarsi which are actually yellowish brown but heavily obscured by the black pile of the legs. The legs are almost wholly black pilose with a few scattered golden hairs towards the base of the femora. *Wings*: hyaline, the dark brown villi nearly restricted to the outer third. The basal half of the stigmal portion of the subcostal cell lying beyond the confluence of the costa and subcosta is pale yellow. The remaining outer part of this cell is hyaline. There is a diffuse brown spot in the subcostal cell below the confluence of costa and subcosta which is about twice as long as wide. There is a very small faint brown spot at the base of the submarginal cell but the cross veins are not tinged with brown. The marginal cell is barely open and is perhaps better described as closed at the costa. *Abdomen*: first and second segments quite translucent and very pale yellow with the posterior margin of the second segment rather narrowly brownish black; this band is a little wider in the middle of the segment where its band occupies not quite a third of the medial length of the segment. The

base of the third segment is narrowly and diffusely yellowish translucent. This translucent area extends widely down the sides and across the posterior portion of the segment leaving a rather wide, smoky, brownish black band across the middle. The extreme margin of the third segment is narrowly black. Fourth segment chiefly yellowish brown with black posterior margin. The pile of the abdomen is yellow on the yellow areas of the first and second segments but black upon the remainder of the abdomen and quite short except upon the anterior corners of the second segment. First, second and third sternites pale yellow and yellow pilose. The third with a narrow brown post margin.

Holotype: male, Pucallpa, Peru, Dec. 4, 1947, Jose Schunke.

Volucella stigmata n. sp.

A small black species with trivittate face. Related to *fracta* Curran. The facial stripes are black, not brown, the second segment of the abdomen has a pair of distinct rounded triangles of brownish yellow. The abdomen is distinctly black, rather than violaceous brown. Length 8 mm.

Female. *Head*: face and cheeks light brown in color with a distinct, central, medial black stripe upon the face over the tubercle and another from the eye margin to the epistoma. The lower part of the front is obscure reddish brown, the upper part of the front and vertex shining black; the facial and frontal pile is pale yellow. The antennæ are yellowish brown, the arista pale yellow, reddish brown apically and there are only eight rays upon the arista; there may have been one or two others basally. The eyes have sparse, short, yellowish or brownish yellow pile. *Thorax*: the mesonotum and scutellum are black with an opalescent greenish reflection, coppery in some lights. The sides of the mesonotum are yellowish brown. There are two long, slender, black bristles on the notopleura, two above the wing, two upon the post calli, one upon the mesopleura, a single pair of

large ones on the scutellum. The scutellum bears a few, lateral, fine, black hairs. The pleura are dark brown, yellowish on the metapleura and upon the suture between the pteropleura and mesopleura. The scutellum has a prominent wide preapical depression. The squamæ are pale yellow with dark brown border and fringe. The halteres are orange with pale yellow knob. *Legs*: the femora are very dark brown, the hind pair black becoming deep brown distally. All of the tibiæ are very dark reddish sepia. The tarsi are all nearly concolorous with the tibiæ. The middle and posterior basitarsi are a little lighter brown in color. Pile of the legs almost entirely black. *Wings*: hyaline except for a pale yellowish brown tinge which seems to be largely caused by the villi but may be partly caused by the wing itself. There are several brown spots on the wing. There is a quite long, deep brown spot at the confluence of the subcosta and costa which is about three or four times as long as wide; the apex of the costal cell is barely included in this spot; beyond this brown spot, in nearly the middle of the stigmal area of the subcostal cell, there is a faint rectangular brownish smudge or spot. There is a darker brown spot covering the furcation of the third vein at the base of the submarginal cell and immediately below it. There is a trace of brown about the remaining central cross-veins. The marginal cell is widely open. *Abdomen*: the first segment is brownish yellow, the second has a pair of prominent, distinct, narrowly separated, rounded and horizontally elongate triangles of brownish yellow. The remainder of this segment is shining black. The third, fourth and fifth segments are quite black with a faint, opalescent greenish reflection which in some lights is a pale brassy or reddish. First and second sternites, except the posterior margin of the second, together with the basal margin of the third sternite, brownish yellow. Remainder of sternum shining black with sparse subapressed pale yellow pile.

Holotype; female. Pucallpa, Peru, Mar. 12, Jose Schunke.

***Volucella scintillans* n. sp.**

A brilliant metallic green and purple species. Related to *earnestina* Curran. Characterized by the black pile on the base of the apex of abdominal segment and the brown spot on the small cross vein of the wing, besides other differences. Length 9 mm.

Male. *Head*: face rather deeply projecting, brilliant metallic green above, bluish violet below. The cheeks have a large yellowish triangle and are metallic behind. There is a double band of pale yellow pubescence running from the eye margin two-thirds of the way to the epistoma. These bands are separated by the posterior border of the metallic blue part of the face; the second band lies, therefore, on the yellowish triangle of the cheeks. There is a thick band of white pollen extending from each eye margin beneath the antennæ and thence in the middle down almost to the center of the tubercle. The facial pile is fine and white and rather sparse. The front and vertex are metallic green; the frontal pile is white except for a few black hairs; the vertical pile is longer and black. The antennæ are elongate and yellowish brown. Third antennal segment perhaps a little darker in the middle and very slightly concave in the middle dorsally. The arista is yellowish brown, becoming darker apically and has about twenty-five rays. The eyes are widely touching, the upper facets only moderately enlarged, the ocular pile thick and nearly white in color. *Thorax*: the mesonotum and scutellum are brilliant metallic green with faint brassy reflections, only the humeri being yellowish brown in color. On the notopleura and all of the pleura except the metapleura the color deepens until it is a deep purplish blue over most of the pleura with less of a greenish reflection. The pile of the mesonotum and scutellum is entirely black with only a few pale hairs behind the humeri and a few more behind the transverse suture. The scutellum has a deep, preapical depression and four pairs of long, black bristles. Squamæ brownish white with a round dark brown spot; they are brown pilose on the outer edge of the upper squamæ; squamal fringe dark sepia brown.

Halteres yellowish with nearly white knob. *Legs*: black with black pile. *Wings*: nearly hyaline upon the posterior part with slightly brownish appearance due to thick brown villi. The outer part of the costal cell, the first basal cell, the basal portion of the submarginal cell and all of the marginal cell, except the apex, are pale yellowish brown. The basal half of the stigmal portion of the subcostal cell is yellowish, the remaining outer half pale brown. There is a distinct, elongate, dark brown spot just behind the point of confluence of the subcostal vein with the costa. There is a smaller brown spot upon the third longitudinal vein at the base of the submarginal cell, a larger one upon the small cross vein and a large but not quite so dark spot upon the apex of the marginal cell which extends into the submarginal cell. The marginal cell is closed with a short stalk. *Abdomen*: the first segment is black, the second, third and fourth are brilliant shining blue with greenish reflections laterally and purplish ones centrally as well as along the posterior and anterior margins of these segments. The pile of the first segment is almost entirely black, being narrowly white only in the middle. Of the second segment it is entirely black except for a broad band of yellowish white pile in the middle which extends from the base some two-thirds the length of the segment. Pile of third segment entirely black except for a few white hairs basally and sublaterally. Fourth segment's pile entirely black throughout.

Holotype: male. Pucallpa, Peru, Dec. 9, 1947, Jose Schunke.

SYNONYMIC AND OTHER NOTES ON FORMICIDÆ (HYMENOPTERA)*

BY WILLIAM L. BROWN, JR.

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In 1945 Dr. E. V. Enzmann published a paper entitled "Systematic Notes on the Genus *Pseudomyrma*."¹ Since this contains more confused taxonomy per page than any other work on the Formicidae I have ever encountered in twelve years of reading in the field, I have considered it advisable to publish an account of some of the synonymy involved.

The worst, but by no means the only, category of errors lies in the series of forms of *Pseudomyrma* described as new from the types which Wheeler had set up in his "Studies of Neotropical Ant-plants and Their Ants," published posthumously in 1942² and overlooked by Enzmann.

Wheeler's types were labelled *as types* in the usual Museum manner, and each series bore Wheeler's clearly legible determination label. Enzmann copied these names and used them in his paper, creating a series of synonym-homonyms, but since he made several mistakes in transcribing the spelling, some of the species may be considered synonymous but not strictly homonymous. Of the remainder of Enzmann's publication, much may be safely ignored by taxonomists, including the erratic keys and the pseudophylogenetic separation into "branches" and "groups." Some forms described as new are from sources other than the Wheeler type material; since the Enzmannian types have not been made available for study, it will devolve upon the future reviser of *Pseudomyrma*, a genus well-scrambled even in pre-Enzmannian times, to decide the fate of the species not treated here.

The species are listed as Wheeler had them, each with the corresponding Enzmannian form beneath it. To

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¹ Psyche, 51: 59-103, 3 pls. (1945).

² Bull. Mus. Comp. Zool. Harvard, 90: 1-262, 56 pls. (1942).

shorten the task, I have given date and page references only; plate and figure references are omitted. References to Wheeler's 1942 and Enzmann's 1945 papers are given in the preceding footnotes. The Museum of Comparative Zoology type catalog numbers are contained in parentheses with the initials (MCZ).

Pseudomyrma allidora Wheeler

Wheeler, 1942, pp. 157-158.

P. allidora [sic!] E. Enzmann, 1945, pp. 77-78 (MCZ 20533).

Pseudomyrma belti subsp. *saffordi* Wheeler

Wheeler, 1942, p. 162.

P. sabanica var. *saffordi* E. Enzmann, 1945, p. 89 (MCZ 20537).

The term "*sabanica*" is evidently a misspelling of Wheeler's specific name *satanica* (*P. satanica* Wheeler, 1942, pp. 174-175), of which Enzmann considered *saffordi* a variety.

Pseudomyrma belti subsp. *venifica* Wheeler

Wheeler, 1942, pp. 162-163.

P. belti subsp. *venifica* E. Enzmann, 1945, p. 81 (MCZ 20538).

Pseudomyrma belti subsp. *bequaerti* Wheeler

Wheeler, 1942, p. 164.

P. belti subsp. *bequaerti* E. Enzmann, 1945, pp. 80-81 (MCZ 23139).

Pseudomyrma latinoda var. *coronata* Wheeler

Wheeler, 1942, pp. 167-168

P. latinoda var. *coronata* E. Enzmann, 1945, p. 88 (MCZ 20542).

Pseudomyrma latinoda subsp. *bradleyi* Wheeler

Wheeler, 1942, p. 169.

P. bradleyi E. Enzmann, 1945, p. 82 (MCZ 22864).

Pseudomyrma sericea var. *acaciarum* Wheeler

Wheeler, 1942, p. 176.

P. sericea var. *acaciorum* [sic!] E. Enzmann, 1945, p. 90 (MCZ 22865).

Pseudomyrma spinicola subsp. *sclerosa* Wheeler

Wheeler, 1942, pp. 180–181.

P. spinolæ [sic!] var. *infernalis* E. Enzmann, 1945, p. 91 (MCZ 20547).

Pseudomyrma spinicola subsp. *sclerosa* Wheeler

Wheeler, 1942, pp. 181–182.

P. spinolæ [sic!] var. *sclerosa* E. Enzmann, 1945, pp. 91–92 (MCZ 23145).

Pseudomyrma triplaridis subsp. *baileyi* Wheeler

Wheeler, 1942, pp. 185–186.

P. triplaridis subsp. *biolleyi* [sic!] E. Enzmann, 1945, pp. 93–94 (MCZ 20548).

Pseudomyrma triplaridis subsp. *tigrina* Wheeler

Wheeler, 1942, p. 186.

P. triplaridis subsp. *trigona* [sic!] E. Enzmann, 1945, pp. 94–95 (MCZ 23147).

Pseudomyrma triplaridis subsp. *boxi* Wheeler

Wheeler, 1942, p. 184.

P. triplaridis subsp. *boxi* E. Enzmann, 1945, p. 94 (MCZ 23146).

The two following forms which Wheeler saw, but refrained from describing, are easily synonymized with common species of *Pseudomyrma*.

Pseudomyrma gracilis (Fabricius)

Fabricius, 1805, Syst. Piez., p. 405 (*Formica*).

P. gracilis var. *longinoda* E. Enzmann, 1945, p. 87 (MCZ 26812).

Pseudomyrma triplarina (Weddell)

Weddell, 1849, Ann. Sc. Nat. Bot. (3) 13: 40-113,
249-268 (*Myrmica*).

P. arboris-sanctæ Emery, 1894, Bull. Soc. Ent. Ital.,
26: 147.

P. arboris-sanctæ var. *ecuadoriana* E. Enzmann, 1945,
pp. 79-80 (MCZ 26809).

The types of *ecuadoriana* are few, partially fragmented, and accompanied by what appear to be *Azteca* workers glued to the card with the *ecuadoriana*. I can see no characters which distinguish them (*ecuadoriana*) from a series of *triplarina* workers from several South American localities in the Wheeler Collection.

Following the publication of Dr. Enzmann's paper on *Pseudomyrma*, others were published by his daughter, Miss Jane Enzmann. All but one of the species described, however, appear to be synonyms of common Nearctic forms. Dr. William S. Creighton has discussed these forms with me, and I am grateful for his opinions on several obscure cases. His forthcoming book, which amounts to a revision of North American ants, will also carry notes on the synonymy of these forms, but technical difficulties prevent him from dealing with them at any length. Most species treated below involve Enzmannian names, but several other forms of older authors are changed in status as well.

Myrmecina americana Emery

M. latreillei subsp. *americana* Emery, 1895, Zool. Jahrb. Syst., 8: 271.

M. latreillei subsp. *americana* var. *brevispinosa* Emery, idem., p. 271.

M. graminicola subsp. *quadrispina* J. Enzmann, 1946, Jour. N. Y. Ent. Soc., 54: 13-15, figs. 1, 2, worker.

In the manuscript of his work on North American ants, which he has kindly allowed me to examine, Dr. Creighton has raised the form known for many years as *Myrmecina graminicola* subsp. *americana* to the rank of species.

There appears little objection to this move, though the differences between the Palearctic *graminicola* and the Nearctic form are very slight. The forms *quadrispina* and *brevispinosa*, however, cannot be considered valid forms.

The Enzmännian subspecies (*quadrispina*) was taken (holotype worker) on the south slope of the Blue Hills, a rather restricted elevated area just outside Boston, Massachusetts. Two colonies collected by me in this locality were confined for several months in artificial nests. Specimens killed at the time of collection and others examined after two months of rearing show a wide range of variation in size, sculpture and color. The larger workers, mostly those killed at the time of collection, agree well with the description and figures, as well as my impressions, gained from a rather cursory examination of the type, of *quadrispina*. These workers also agree with Emery's original description of *americana* and with specimens identified as *americana* by Wheeler and by Creighton.

My nests also produced, after a month or so of starvation conditions, small light-colored workers corresponding well with published descriptions of *brevispinosa* and with specimens determined as such in the Wheeler Collection. These workers were raised from small larvæ during a period in which the colonies refused all types of prepared foods, including bread and fats. When ripe seed-heads of timothy and some small herbaceous plants were later introduced, the colony eagerly accepted the seeds as food, but the workers which had previously hatched never became, even after four weeks, as fully colored as the workers reared in the wild. I conclude that the variant *brevispinosa* is merely the stunted workers from either an incipient or poorly-nourished colony.

Both my nests were taken under large, well-embedded stones in a rich, shady beech woods. Each colony occupied a small oval chamber in the soil, about three quarters of an inch in greatest diameter and less than a quarter inch deep, with the smooth lower surface of the stone

forming the immediate roof. The artificial nests were set up on the evening of collection (June 10). A few males also developed from the larvae taken with the nests, and these pupated during early August and developed into adults in late August. All the males escaped both nests through cracks during one night in early September, presumably on nuptial flight, since they had not previously attempted to leave the brood chamber which the ants constructed at the end of each nest from small particles of earth that had been scattered over the nest floor. These chambers were an almost exact replica of the ones found under the stones, open at the top and with a small passage at one side.

The queens never left the brood except on the occasion of the introduction of the first grass seed, when all the workers and one queen left the brood and examined the seeds. The queen returned after a brief period and resumed her watch over the brood.

In studying various *Myrmecina* in the Wheeler Collection, I have seen other forms of very doubtful validity. All these are presently considered subspecies of *graminicola*, under which Wheeler placed them in his original descriptions. *Texana* is supposed to differ from *americana* by its "scotch grain" shagreening of the first gastric segment. However, specimens from many localities in the states east of the Mississippi also possess this characteristic to a varying degree, and specimens from North Carolina and northern Ohio show much heavier sculpture of this type than do the *texana* types. The *texana* types, however, do seem to differ slightly from *americana* in having a much less definitely longitudinal orientation to the rugulation of the head, with the longitudinal rugæ having many prominent transverse spurs and branches. Other Texan specimens I have seen all belong to the typical *americana*, including a specimen identified by Wheeler as *texana*. Since sculpture appears to be one of the several very unstable features of Holarctic *Myrmecina*, I believe that further collecting in Texas and Mexico will show that this form is synonymous with *americana*.

Wheeler's two Oriental forms, *graminicola* subsp. *nipponica* and *graminicola* subsp. *sinensis*, are also doubtful. The former has the anterior clypeal tubercles developed much as in *graminicola*, and seems hardly separable from that form. The latter has the clypeal tubercles reduced and seems scarcely distinguishable from *americana*. I should not be surprised if *sinensis* were to prove to be the same as *sicula*, from the southern Palearctic region; or if both of these (*sicula* and *sinensis*) were identical to *americana*. In fact, the entire Holarctic *Myrmecina* fauna may end by being considered as one huge species cline in which the geographical races have not yet become sufficiently isolated to form distinct subspecies exclusively inhabiting a given area.

Tetramorium cæspitum (Linnæus)

Linnæus, 1785, Syst. Nat. (Ed. 10), 1: 581 (*Formica*)

Myrmica (*Myrmica*) *brevinodis* var. *transversinodis*
J. Enzmann, 1946, Journ. N. Y. Ent. Soc., 54: 47–49, figs. 1, 2, worker.

Dr. Creighton and I are in complete agreement that this form (*transversinodis*) must be added to the long list of synonyms of the common pavement ant. Although I have not seen the type, the description, figures and notes on the habits leave little doubt of the correct placement. This ant should not be mistaken for *Myrmica lævinodis*, listed under various names and possibly a subspecies of *M. rubra*, which is an introduced form quite common in the Boston area. *M. lævinodis* sometimes enters houses, but then as solitary individuals probably brought in on clothing, as has been my frequent observation in Cambridge. This *Myrmica* possesses a very potent sting, the effects of which may last for several hours.

Crematogaster lineolata (Say)

Say, 1836, Boston Jour. Nat. Hist., 1: 290,
all castes (*Myrmica*).

C. lineolata cerasi var. *punctinodis* J. Enzmann, 1946,
Jour. N. Y. Ent. Soc., 54: 91–92, pl. 2, fig. 7, all
castes.

C. lineolata cerasi var. *wheldeni* J. Enzmann, idem., p. 92, worker.

Dr. Creighton and I agree that these two forms either represent the typical *lineolata* or intergrade with what Dr. Creighton considers subsp. *subopaca*. Enzmann has raised *cerasi* Fitch to subspecific rank, but Dr. Creighton's forthcoming book will show that this name must be dropped.

Crematogaster vermiculata Emery

Emery, 1895, Zool. Jahrb. Syst., 8: 286.

Considered impossible of exact determination, but probably equivalent to *vermiculata* or an intergrade between *vermiculata* and a subspecies, are three forms described in a paper by Jane Enzmann in 1946.³ These all have in common the name *coachellai* and the subgeneric classification as *Crematogaster* (*Acrocælia*), but here the consistency ends. The synonymous forms with page references to Miss. Enzmann's paper are as follows: *C. lineolata* subsp. *coachellai* "E. Enz. in lit.," p. 93, sec. iii. *C. sanguinea* subsp. *coachellai* "E. Enzmann, in lit.," p. 95, couplet 19. *C. lineolata* var. *coachellai* J. Enzmann, Pl. 2 (p. 97), fig. 3.

The first of these three names is given in a grouped list with a superficial characterization of major sections only, the second appears in a dichotomous key, and the third appears in the legend to the plate. It is doubtful whether or not the authorship should be ascribed to E. Enzmann for the first two of these, even though it seems clear that such was intended. The types of these forms have not been made available to me for study, so I consider the form *coachellai* unrecognizable in the absence of a proper description.

In still another paper by Jane Enzmann⁴ the tribe *Aphanogastrini* is set up, a category which is untenable. The genera included in this "tribe" have numerous intergrades with other groups of the *Pheidolini*,⁵ to which

³ Jour. N. Y. Ent. Soc., 54: 91-92 (1946).

⁴ Journ. N. Y. Ent. Soc., 55: 147-152, (1947).

⁵ *Pheidolini* Emery, Rend. Acad. Sc. Bologna, (1913-14).

Aphænogaster and *Novomessor* clearly belong. One astounding error is the appearance of *Lobognathus* as a *sub-genus* in the key on page 152. This appeared to be miscopy of a large label earlier placed by Dr. Creighton on an unidentified specimen of *Veromessor*: Creighton's label in the Wheeler Collection reads "*lobognathus* new subspecies." The name must be considered a *lapsus* and a synonym of *Veromessor*.⁶

Two of the species described in this paper are minor workers, probably from incipient nests, of two well-known North American ants, which are listed below.

Novomessor albisetosus (Mayr)

Mayr, 1886, Verh. Zool.-bot. Ges. Wien, 36: 443-446,
(*Aphænogaster*).

N. cockerelli var. *minor* J. Enzmann, 1947, pp. 147-148,
Pl. 8, top.

Aphænogaster fulva Roger

Roger, 1863, Berl. Ent. Zeitschrift, 7: 190.

Aphænogaster fulva var. *rubida* J. Enzmann, 1947, pp.
147-148, Pl. 8, bottom.

I have not considered other Enzmannian forms because of my unfamiliarity with the groups concerned and because of my lack of time and taste for the task. The publications considered above should certainly suggest to all who examine them the need for some means of formal nullification of the published extremes of such irresponsible taxonomy.

⁶ *Veromessor* Forel, 1917, Bull. Soc. Vaud. Sc. Nat., 51: 235 (described as subgenus of *Novomessor*).

PSYCHE

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ON A SMALL COLLECTION OF FULGOROIDEA (HOMOPTERA) FROM THE VIRGIN ISLANDS¹

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The Virgin Islands, which lie between 18°55 N. 64°10 W. and 18°25 N. 65°00 W., are the eastern outliers of the Greater Antilles. St. Thomas, the westernmost, is separated by a channel 30 miles wide from Culebra, off Puerto Rico, while St. John is 70 miles from the St. Barts group to the south. St. Croix, though politically grouped with the Virgin Islands, is not considered here as it stands apart from the chain of islands between St. Thomas and Anegada.

The natural vegetation of these islands consists to an overwhelming extent of dry scrub. At the summit of the highest points occur small patches of woodland with the characteristics of true mountain forest.

As far as Fulgoroidea are concerned, the affinities of the fauna are unquestionably with that of Puerto Rico, and it would seem (in the absence of collections from the St. Barts group) that the islands represent the furthest limit of some of the Greater Antillean species. Of the species discussed below *Bothriocera eborea* Fenn. and *Sogata furcifera* (Horv.) are the only two which range southward through the Leeward and Windward Islands: *Oliarus campestris* Fenn., *Petrusa marginata*

¹ Published with a grant from the Museum of Comparative Zoology at Harvard College.

(Brunn.) and *Melormenis quadripunctata* (F.) occur in the Greater Antilles and in the Leeward Islands (Antigua, St. Kitts, Nevis, Montserrat) but not in the Windward Islands; *Cubana tortriciformis* Muir is represented in the Lesser Antilles by very close geographical equivalents grouped around the St. Vincent *Cubana tortrix* Uhl.; *Neurotmeta* occurs as far south as Dominica; *Oliarus campestris* is very clearly replaced in the Windward Islands and Trinidad by *O. maidis* Fenn. The group of species or subspecies closely resembling *Acanalonia depressa* Mel. has no representatives in the Lesser Antilles, while the *Thionia* described below is not very close to any Lesser Antillean species. The genera *Ladella*, *Remosa*, and *Tangella* and the flatid *Parthenormenis* described below do not occur in the Lesser Antilles and have no obvious equivalents there, though by contrast the forest-dwelling *Chasmacephala* of the Windward Islands clearly shares a common ancestry with the Greater Antillean *Parahydriena* and *Cyphoceratops*.

In so small a collection little significance can be attached to the absence of species but, in view of their abundance in the Leeward Islands as far north as Anguilla, the writer would have expected to find a species of *Ilesia* among the flatids of the littoral zone. The genus *Antillormenis* does not reach northward of the Leeward Islands and even here occurs only in Montserrat.

CIXIIDÆ

Cubana Uhler

Uhler 1895 *Proc. Zool. Soc. Lond.*: 62. Haplotype, *Cubana tortrix* Uhler *loc. cit.*: 62.

Cubana tortriciformis Muir

Muir 1924 *Proc. Haw. Ent. Soc.* 5, 3: 461.

A single female taken by the writer at Road Town, Tortola (Feb. 25, 1944) is assigned to this species. The specimen differs from the type of *C. tortrix* only in having the distal fuscous line in the tegminal membrane overlying cell R2 and the large spot basad of it biconcave on its inner face. It is probable that *Pintalia alta* Osborn is this species.

Oliarus (Melanoliarus) Fenn.

Fennah 1945 *Proc. Biol. Soc. Wash.* 58: 141. Subgenotype, *Oliarus maidis* Fenn. 1945 *Proc. U. S. Nat. Mus.* 95: 423.

Oliarus (Melanoliarus) campestris Fenn.

Fennah 1945 *loc. cit.*: 141.

One male was taken by the writer on Jost Van Dyke (Feb. 18, 1944). In this subgenus of *Oliarus* each ovary comprises sixteen ovarioles. In the closely allied genus *Vincentia* each ovary has eighteen ovarioles.

Bothriocera Burm.

Burmeister 1835 *Handbuch der Entomologie*: 156. Haplo-type, *Bothriocera tinealis* Burmeister *loc. cit.*: 156.

Bothriocera eborea Fenn.

Fennah 1943 *Psyche* 52: 14.

Three males and four females were taken by the writer on Jost Van Dyke on *Coccoloba uvifera* (Feb. 18, 1944), and two males and eight females on Tortola (Feb. 15-17, 1944).

DELPHACIDÆ

Sogata Distant

Distant 1906 *F. B. I.* 3: 471. Orthotype, *Sogata dohertyi* Distant *loc. cit.*: 471.

Sogata furcifera (Horv.)

Delphax furcifer Horvath 1899 *Term. Fuz.* 22: 372.

One male taken by the writer at Road Town, Tortola (Feb. 14, 1944). This generic assignment is merely provisional pending revision of the family.

TROPIDUCHIDÆ

The tropiduchid fauna of Central America and the West Indies is rich in genera and nomenclatorial confusion has arisen as a result of changed conceptions of generic limits. In his classification of the family Melichar accorded tribal status to genera in which a costal area with transverse veinlets is present in the tegmina; genera within this group characterised by marked elonga-

tion of the vertex were separated as a further tribe (Peggiogini). These tribal characters are not rigorous in their application, but intergrade with those found in the Tambiniini both in West Indian and Australasian genera. The development of a costal area, for example, may vary within a single genus. The South American *Rotunosa indicanda* (Wlk.) has a narrow costal area with distinct transverse veinlets in the distal part of the corium; nearer the base the costal area narrows and these veinlets progressively merge into the membrane, where they are visible only as faint striæ, and finally disappear. In *Rotunosa grandis* (Fenn.) the costal vein is slightly submarginal and devoid of transverse veinlets, though towards the node faint transverse striæ can be detected. This condition can be matched elsewhere in tambiniine Tropiciduchidæ. As far as American genera are concerned the writer proposes to regard all in which the antennæ are short, with the second joint subglobose, the mesonotum less than 1.5 times as broad as long with the lateral discal carinæ parallel in their basal half, the tegmina thin and subhyaline, with a line of transverse veins between the node and apex of the clavus as belonging to a single subfamily. This group appears to be naturally related to the Old World *Tropiciduchus*.

A key to the new world genera, based on this view, is given below, being modified from the writer's earlier key to Tambiniini (*sensu* Melichar).

KEY TO NEW WORLD GENERA OF TROPIDUCHINI

- (1) (2) Tegmina with a distinct costal area, subequal in width to costal cell, traversed by veinlets to margin for most of length (3)
- (2) (1) Tegmina with costal vein marginal, or very narrowly separated, no veinlets to margin along most of length (11)
- (3) (4) Vertex twice as long as broad or nearly so
Pseudotangia Metcalf
- (4) (3) Vertex relatively shorter (5)
- (5) (6) Vertex as long as broad or slightly longer than broad (7)
- (6) (5) Vertex broader than long (9)

- (7) (8) Frons with an oblique ridge distally on each side of middle *Vanuoides* Metcalf
- (8) (7) Frons with median carina only *Ladella* Stål
- (9) (10) Median carina of vertex Λ -shaped
Tangyria Uhler
- (10) (9) Median carina simple, not forked basally
Tangella Metcalf and Bruner
- (11) (12) Vertex as long as pronotum and mesonotum, more than twice as long as broad (13)
- (12) (11) Vertex produced before eyes but not greatly prolonged anteriorly (15)
- (13) (14) Vertex with median carina simple to base
Remosa Distant
- (14) (13) Vertex with median carina forked basally
Rotunosa Distant
- (15) (16) Tegmina with one or no transverse line distad of nodal line (17)
- (16) (15) Tegmina with numerous irregular cross-veins in membrane (25)
- (17) (18) Vertex distinctly longer than broad (19)
- (18) (17) Vertex not longer than broad (21)
- (19) (20) Tegmina with a row of subapical areoles distad of nodal line *Athestia* Melichar
- (20) (19) Tegmina with only apical areoles distad of nodal line, no subapical line *Biruga* Fennah
- (21) (22) Vertex three times as broad as long
Colgorma Kirkaldy
- (22) (21) Vertex twice as broad as long, or less (23)
- (23) (24) Species more than 7 mm. long; lateral pronotal fields and mesopleurites green
Neorudia Fennah
- (24) (23) Species less than 7 mm. long; lateral pronotal fields at margin and a spot on mesopleurites piceous *Amapala* Melichar
- (25) (26) Vertex with median carina simple, unbranched basally (27)
- (26) (25) Vertex with median carina λ or Λ -shaped (33)
- (27) (28) Frons ecarinate, sides of vertex parallel
Pelitropis Van Duzee
- (28) (27) Frons medially carinate (29)

- (29) (30) Tegmina with M not forked before nodal line; two irregular ranks of transverse veins in membrane distad of nodal line *Anaclardea* Muir
- (30) (29) Tegmina with M forked before nodal line, more than two ranks of irregular transverse veins in membrane (31)
- (31) (32) Media forking near base of tegmen
Monopsis Spinola
- (32) (31) Media forking near middle of tegmen
Neurotmeta Guérin-Ménéville
- (33) (34) Vertex with median carina Λ -shaped (35)
- (34) (33) Vertex with median carina Λ -shaped (39)
- (35) (36) Vertex longer than broad, directed upward distally *Dictyotangia* Fennah
- (36) (35) Vertex not longer in middle line than broad across base (37)
- (37) (38) Vertex as broad as long in middle, lateral margins of frons not meeting lateral margins of vertex, a broad callus on anterior margin of vertex *Aripoa* Fennah
- (38) (37) Vertex broader than long, lateral margins of frons meeting lateral margins of vertex, anterior margin of vertex not callused
Neotangia Melichar
- (39) (40) Submarginal carinae of pronotum obsolete, represented only by a hump, species about 6 mm. long, tawny, marked with spots of darker brown *Tangidia* Uhler
- (40) (39) Submarginal carinae of pronotum very sharp, arcuate, species about 8.6 mm. long, uniformly pale green *Dioxyomus* Fennah

Ladella Stål

Stål 1859 *Berl. Ent. Zeit.* 3: 319. Haplotype, *Monopsis pallida* Wlk.

Ladella pallida (Wlk.)

Monopsis pallida Walker 85. List Hom. 2: 325.

The figures were kindly made by Mr. W. E. China from the type. It is very distinct from the Puerto Rican species identified as *Monopsis pallida* by Stål and figured

by Melichar (1914 *Ver. Nat. Ver. Brunn* 53: 106). The latter species, based on Stål's labelled specimen in the Berlin collection, requires a new name, for which *Ladella ståli* is now proposed.

Tangella Metcalf and Bruner

Metcalf and Bruner 1930 *Psyche* 37, 4: 397. Orthotype
Tangia kraatzii Stål *Berl. Ent. Zeit.* 3: 318.

Tangella schaumii (Stål)

Tangia schaumii Stål 1859 *Berl. Ent. Zeit.* 3: 318.

Male. Length, 5.6 mm.; tegmen, 4.9 mm.

Vertex 3.3 times as broad as long in middle line, medially carinate, carina broad, obsolete at apex, simple at base; frons in middle line 1.5 times as long as broad, a broad callus across basal margin, median carina rather broad. Pronotum with disc large, carinae stout, two carinae at each lateral margin between eye and tegula; mesonotum relatively long, lateral carinae of disc parallel in basal half. Tegmina with costal area broad with about 14 transverse veinlets, nodal line straight, Sc + R fork distad of M fork which is distad of Cu 1 fork, none of these veins forked again before nodal line, membrane with five or six irregular ranks of transverse veinlets, about 16 cells adjoining apical margin between node and apex of clavus. Post-tibiae with three spines.

Anal segment relatively narrow, each lateral angle produced into a spatulate vertical lobe. Aedeagus laterally flattened, upcurved distally, a long spine lying below it on left, bent across to right and curved upward at apex, a group of four processes at apex of aedeagus, the basal process sinuate and spinose, the lateral flattened, symmetrical, pointed distally, the median acicular.

Redescribed from a male taken, along with a nymph, on Jost Van Dyke (Feb. 18, 1944).

Tangyria Uhler

Uhler 1901 *Proc. Ent. Soc. Wash.* 4.: 512. Haplotype,
Tangyria frontalis Uhl.

Tangyria frontalis Uhler

Uhler 1901 *loc. cit.*: 512.

The figures, made by the writer from a female specimen from Port au Prince, Haiti, in the U. S. National Museum bearing Uhler's label, are published to facilitate identification of this genus.

Amaclardea Muir

Muir 1931 *Ann. Mag. Nat. Hist.* (10) 7: 301. Orthotype, *Amaclardea gowdeyi* Muir.

Amaclardea gowdeyi Muir

Muir 1931 *loc. cit.*: 302.

The figures were made by Mr. China from the type. The genus has not yet been reported outside Jamaica.

Neurotmeta Guérin-Ménéville

Guérin-Ménéville 1856 *Hist. Fisica. Homopt.*: 180. Logotype, *Neurotmeta sponsa* Guérin-Ménéville.

Neurotmeta viridis (Wlk.)

Monopsis viridis Walker 1851 *List Hom.* 2: 325.

Ædeagus with two short spines closely approximated and directed caudad lying adpressed to ventral surface, the spine on left slightly curved laterad at apex; apical portion of ædeagus membranous, with a broad opening on right side, an aciculate porrect sclerotised and pigmented spine near dorsal margin directed caudad, a broad tapering process near ventral margin on right, rather flattened, somewhat sclerotised but not pigmented, curved dorsad distally, acute at apex.

The Lesser Antillean representatives of *Neurotmeta* agree with the species before the writer in all adult structures examined, with the exception of the ædeagal armature, which differs considerably in detail, although conforming to a standard basic pattern of two or three ventral spines along the ventral margin, and from one to four processes directed caudad on the apical membranous portion.

One male and four females and a nymph taken by the writer on *Coccoloba uvifera*, Virgin Gorda (Feb. 11,

1944), and one female and two nymphs on the same host, Tortola (Feb. 21, 1944). Walker's type from St. Thomas is a female, and the above assignment requires confirmation.

Colgorma Kirkaldy

Kirkaldy 1904 Ent. 37: 279. Orthotype, *Achilus dilutus* Stål.

Colgorma diluta (Stål)

Achilus dilutus Stål 1859 Eugen. Resa. 4: 271.

This genus superficially resembles the following, but is readily separated by the tribal character of a relatively long mesonotum. The frons of the type species is longer than broad (1.3:1) and medially longitudinally tumid rather than carinate.

Tangiopsis Uhler

Uhler 1901 Proc. Ent. Soc. Wash. 4: 512. Haplotype, *Tangiopsis tetrastichus* Uhler.

Tangiopsis tetrastichus Uhler

Uhler 1901 loc. cit.: 513.

The figures are of the Haitian type in the U. S. National Museum, and are given merely to illustrate the differences between *Tangiopsis* and *Colgorma*, as no material of either genus is to hand from the Virgin Islands.

ACANALONIIDÆ

Acanalonia Spinola

Spinola 1839 Ann. Soc. Ent. France. (1) 8: 447. Haplotype, *Acanalonia servillei* Spin.

Acanalonia depressa Melichar

Melichar 1901 Ann. K. K. Nat. Hist. Hofmus 16, 3: 190, pl. 1, fig. 6.

Ædeagus submembranous, not pigmented, a broad fold laterally on each side near base, narrowing distally into a ribbon-like process which recurves at apex and lies below ædeagus to its base, giving off a small S-shaped spine

laterally, and truncate at apex; remaining portions as figured.

Two males taken by the writer on Jost Van Dyke (Feb. 18, 1944). These specimens differ from Melichar's description and figure only in the profile of the head. According to Dr. Paul Oman, material from St. Thomas and St. Croix differs from the Puerto Rican *A. brevifrons* Muir in being smaller, and having the vertex more sharply declivous, the portion of the head in front of the lateral frontal carinæ shorter, the costal margin of the tegmina more strongly curved and the anterior portion of the apical margin more broadly rounded. The male genitalia of the specimen before the writer are very close to those of *A. impressa* Metc. and Bruner. The species is evidently polytypic and the taxonomic relationship of its members might be most appropriately expressed by regarding *brevifrons* and *impressa* as geographical subspecies.

ISSIDÆ

Thionia Stål

Stål 1859 *Berl. Ent. Zeit.* 3: 321. Logotype, *Issus longipennis* Spinola 1839 *Ann. Soc. Ent. France* (1) 8: 348.

Thionia argo sp. n.

Male. Length, 5.8 mm.; tegmen, 4.3 mm. Female. Length, 6.7 mm.; tegmen, 5.0 mm.

Vertex broader than long in middle line (1.5:1), slightly depressed, anteriorly transverse, posteriorly angulately excavate, frons very slightly longer than broad, median carina most prominent in basal half, four callosities on each side near margin, lateral discal carinæ visible only near base where they curve to unite at middle. Posttibiæ bispinose.

Fuscous; all carinæ and margins, parallel oblique striæ on clypeus, minute speckling on frons, vertex, pro- and mesonotum, and sometimes a transverse bar in basal third of frons, and abdominal ventrites testaceous; sides of head on concealed surface behind eyes and a round spot in each lateral field of pronotum piceous. Tegmina

translucent, testaceous, marbled with fuscous, though not in basal third of corium, three oval spots in cell R, a similar spot basally and a fainter spot distally in cell M 3 + 4 fuscous-piceous. Veins fuscous-piceous, paler in clavus. Transverse veins mostly pallid.

Anal segment of male elongate-rhomboidal, convex-truncate at apex, anal foramen near middle. *Ædeagus* moderately short, tubular, curved upward distally, dorsal margin with an eminence on each side at base and at middle, the latter bearing a short tooth directed caudad, a pair of long spines arising laterally at middle, curved outward, cephalad and finally mesad; *ædeagus* distally reflected anteriorly in the form of a trough, striate and membranous. Genital styles short and stout, subtriangular, expanding distally; apical process broad, hollowed out on its anterior surface, minutely pointed at apex and with a crescentic plate attached laterally near its base.

Anal segment of female very long distad of anal foramen, deeply rounded at apex.

Nymph with vertex relatively shorter than in adult, the pro- and mesotibiæ distinctly foliate and post-tibiæ four-spined.

Described from four males and seven females and four nymphs taken by the writer on Jost Van Dyke (Feb. 18, 1944). This species may well prove to be closely allied to the Puerto Rican *Thionia borinquensis* Doz. and the Jamaican *Thionia impressa* Melichar, though it differs markedly in the coloration of the tegmina. Holotype ♂ and allotype ♀ at Mus. Comp. Zool. No. 27819.

FLATIDÆ

Parthenormenis gen. nov.

Frons as long as broad, apical margin little shorter than basal, lateral margins shallowly arcuate; vertex obsolete. Pronotum anteriorly roundly convex, posteriorly subangulately concave, a distinct broad callus along anterior margin near middle, a slight median sulcus posteriorly; mesonotum not inflated with median carina indicated only at base, lateral carinæ feebly present

throughout; post-tibiæ bispinose, abdomen dorsally rounded, not conical. Tegmina moderately expanding distally, costal margin straight distad of middle, apical margin straight, apical angle rounded, sutural angle rectangulate, rather abruptly rounded, costal area slightly narrower than costal cell one third from base, costal veinlets shorter than apical veins, apical veins mostly forked, apical line slightly irregular but distinct, joining costa anteriorly, nodal line indistinguishable, Sc simple to apex, R forking near middle of tegmen, M forking slightly basad of R fork, Cu 1 forking basad of M fork. Wings with R simple to apex, M with two branches, Cu 1 with five branches.

Anal segment of female broadly ovate, indented at apex, anal foramen relatively small. Ovipositor with third valvulæ each armed with nine or ten stout spines in two rows, with a single spine situated on inner face remote from margin.

Type species, *Parthenormenis sanctæ-ursulæ* sp. n.

Parthenormenis sanctæ-ursulæ sp. n.

Female. Length, 6.0 mm.; tegmen, 6.2 mm.

Testaceous-yellowish; pronotum and mesonotum clouded fuscous, legs faintly so; abdomen pallid, sclerotised portions of genitalia piceous. Tegmina translucent, brownish, anterior half of costal membrane and transverse veinlets just basad of apical line of cross-veins pallid; base of costal cell, except at margin, and base of clavus deeply infuscate. Veins on corium deeply fuscous, on membrane concolorous. Wings infuscate, veins dark fuscous. Insect in life powdered brownish or pruinose, somewhat variegated.

Ovipositor with third valvulæ armed on posterior margin with a row of five or six stout teeth; basad of this an inner row of two or three teeth, and a single tooth still further basad on inner face.

Described from a single female taken by the writer at 1,000 ft., Tortola (Feb. 20, 1944). Type at Mus. Comp. Zool. No. 27930. The genus, to which at present only this species is referred, is distinguished by having the

apical margin of the tegmina transverse, not oblique, and the sutural angle boldly, though not sharply, rectangulate, and by the armature of the third valvulæ. It differs from *Ormenoides* Mel. in the shape of the frons, and from *Ormenana* Metc. in that of the tegmina.

Melormenis Metcalf

Metcalf 1938 *Bull. Mus. Comp. Zool.* 82, 5: 395. Orthotype, *Cicada quadripunctata* F.

Melormenis quadripunctata (F.)

Cicada quadripunctata Fabricius 1794 *Ent. Syst.* 4: 30.

Ten males and eight females, Jost Van Dyke (Feb. 18, 1944), twenty-six males and sixteen females, Tortola (Feb. 14-17, 19-24, 1944), three males, Virgin Gorda (Feb. 11, 1944).

Petrusa Stål

Stål 1869 *Hem. Fabr.* 2: 111; (1866 *Hem. Afr.*: 237). Haplotype, *Cicada marginata* Brunnich.

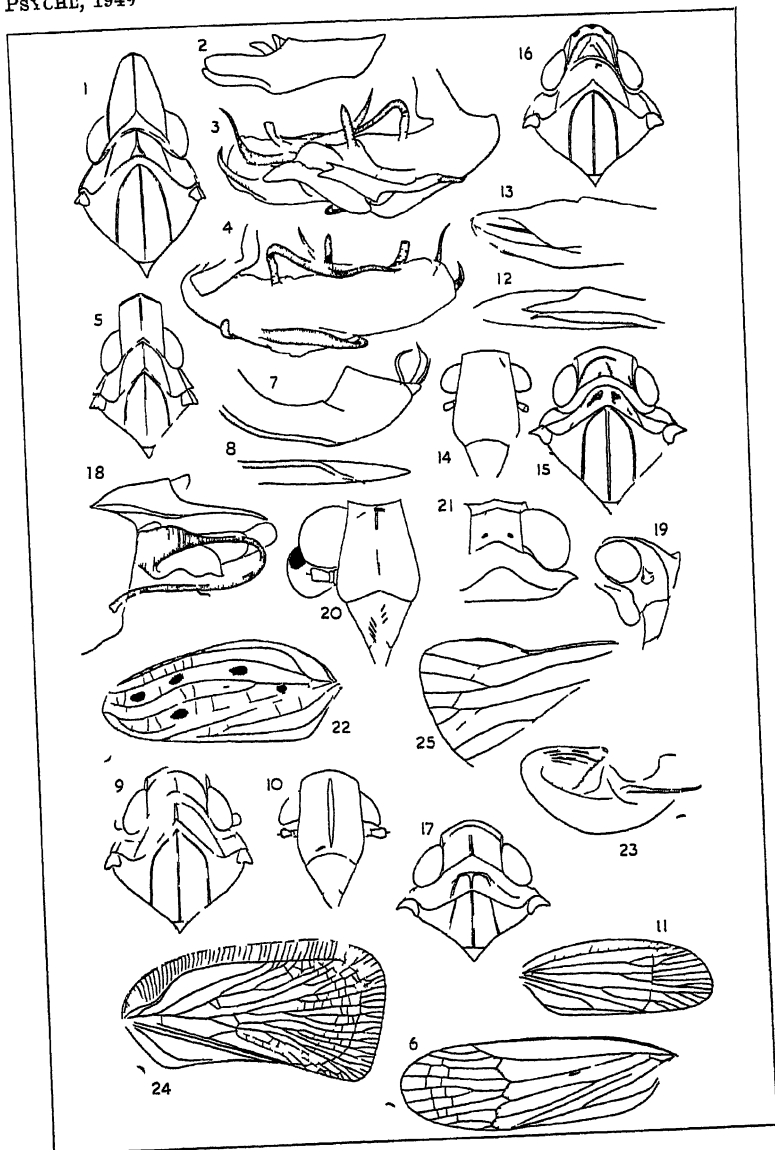
Petrusa marginata (Brunnich)

Cicada marginata Brunnich 1767, in Linné *Syst. Nat.* 1 (2): 710.

Four males and ten females taken by the writer on Jost Van Dyke (Feb. 18, 1944), six males and seven females, Tortola (Feb. 14-17, 1944), eight males and four females, Virgin Gorda (Feb. 11, 1944). Both color forms are represented in each batch of material.

EXPLANATION OF PLATE 4

1. *Ladella pallida* (Wlk.) vertex, pronotum and mesonotum.
2. idem, anal segment of male, ventrolateral view.
3. idem, ædeagus, right side.
4. idem, ædeagus, left side.
5. *Amaclardea gowdeyi* Muir, vertex, pronotum and mesonotum.
6. idem, tegmen.
7. *Tangella schaumii* (Stål), ædeagus, left side.
8. idem, ædeagus, ventral view.
9. idem, vertex, pronotum and mesonotum.
10. idem, frons and clypeus.
11. idem, tegmen.
12. *Neurotmeta viridis* (Wlk.), ædeagus, ventral view.
13. idem, ædeagus, right side.
14. *Colgorma diluta* (Stål) frons and basal part of clypeus.
15. idem, vertex, pronotum and mesonotum.
16. *Tangyria frontalis* Uhl., vertex, pronotum and mesonotum.
17. *Tangiopsis tetrastichus* Uhl., vertex, pronotum and mesonotum.
18. *Acanalonia depressa* Mel., anal segment and ædeagus, left side.
19. idem, head in profile.
20. *Thionia argo* Fenn., frons and clypeus.
21. idem, vertex and pronotum.
22. idem, tegmen.
23. idem, ædeagus, left side.
24. *Parthenormenis sanctæ-ursulæ* Fenn., tegmen.
25. idem, apical portion of wing.



A NEW GENUS AND SPECIES OF THERIDIIDÆ FROM EASTERN TEXAS (ARANEÆ)¹

BY ELIZABETH B. BRYANT

Museum of Comparative Zoology

Among some material sent me several years ago, by Miss Sarah E. Jones collected by her at Dallas, Texas, was a small male spider which particularly attracted my attention. Tentatively I placed it in the little known genus *Umfila* Keyserling, (Theridiidæ), based on a single species from Brazil. Recently, I had the pleasure of showing it to Dr. Alexander Petrunkevitch of Yale University. He kindly called my attention to characters which certainly preclude it from that genus and suggested that a new genus be erected for it.

Genus *Mufila* gen. nov.

Cephalothorax about as wide as long, anterior margin broadly convex, longer than the posterior margin, cephalic portion rather high, thoracic groove long, in a depression; *eyes* closely grouped, differing little in size, anterior row slightly recurved, a.m.e. largest of the eight, posterior row almost straight, lateral eyes touching; *quadrangle* wider in front and not as high as wide; *clypeus* very high, about three times the height of the quadrangle; *mouth parts* weak; *sternum* oval, three-quarters as wide as long, anterior margin rounded, posterior margin pointed and extending between the fourth coxæ; *abdomen* narrow, pointed above the spinnerets, with a corneous ridge at the base which connects with a large epigastric scutum; *legs*, 4-1-2-3, with no spines, a tarsal comb of 6 to 7 curved bristles on the fourth metatarsus; *palpus* large, patella short and much rounded on the dorsal side, tibia small. Female not known.

¹Published with a grant from the Museum of Comparative Zoology at Harvard College.

Genotype: *Mufila texana* spec. nov.

The genus *Mufila* probably belongs with the *Asageninae*, as a remnant of a stridulating organ remains on the base of the abdomen. It differs from the other genera in that sub-family by the very broad cephalothorax, the high clypeus and the closely grouped eyes that vary little in size. It differs from the genus *Umfila* Keys. by the cephalothorax which is as wide as long, the very high clypeus, the pointed sternum, and the lack of a dorsal scutum on the abdomen.

Mufila texana spec. nov.

Figure 1

Male. Length, 2.5 mm., ceph. 1.2 mm. long, 1.2 mm. wide, abd. 1.4 mm. long, 0.7 mm. wide.

Cephalothorax golden brown, shining, with a few short hairs below the a.m.e., almost circular, anterior margin strongly convex, and wider than the posterior margin, sides rounded, almost flat, cephalic portion highest, thoracic groove long and deep, in a depressed area; *eyes* closely grouped, area slightly elevated, each eye heavily ringed with black, and not varying much in size, anterior row slightly recurved, a.m.e. largest of the eight, separated by about a diameter and from the a.l.e. by a little less, posterior row the same length as the anterior row, almost straight, eyes equidistant and subequal, p.m.e. separated by little more than a diameter, lateral eyes touching; *quadrangle* wider in front and not as high as wide; *clypeus* below a.m.e. almost equals three times the ocular area, with a stripe of short dark hairs directed upward, from the margin to the a.m.e.; *mandibles* dark, small and vertical, weak, fang short; *labium* very narrow, more than twice as wide as long, suture between the labium and sternum very indistinct; *maxilla* yellow, shaded with gray, more than twice as long as the labium and strongly inclined; *sternum* bright yellow, darker about the margins, slightly convex, three-quarters as wide as long, anterior margin rounded, posterior margin pointed, first pair of coxæ widely separated, fourth pair

of coxæ separated by more than a diameter and the sternum carried between; *abdomen* oval, pointed above the spinnerets, two-thirds as wide as long, brown with five white spots, at the base a corneous line which may be the remnant of a sound organ, but no cross ridges on the cephalothorax remain, many long scattered hairs from corneous pits, venter pale, with a strongly marked epigastric scutum that covers the basal third and connects

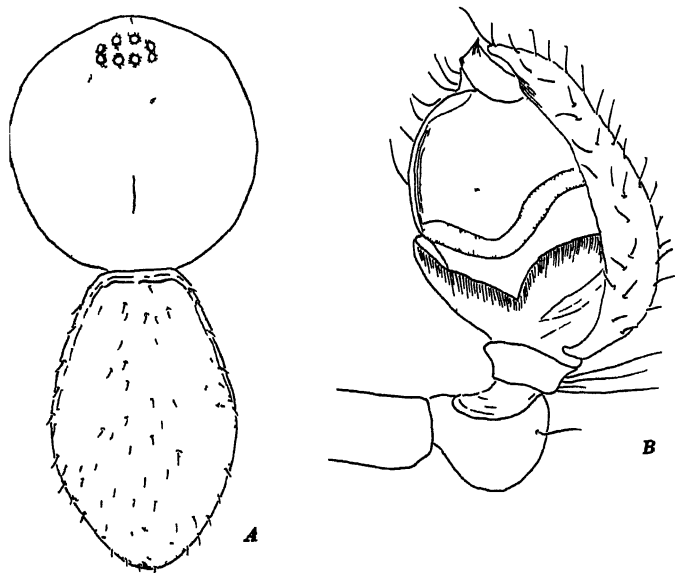


Figure 1. *Mufila texana* spec. nov. ♂. A, Dorsal view. B, Left palpus, lateral view.

with the corneous ridge on the dorsum, a broad dark ring surrounds the spinnerets which may be chitinated, spinnerets small, posterior spiracle probably opens directly anterior to the spinnerets, two small chitinated ovals about the middle of the venter, may be muscle spots;

legs, $\frac{1}{2.0} \frac{2}{1.8} \frac{3}{2.0} \frac{4^*}{2.6}$, rather short, pale yellow, with the

* The leg formula used was suggested by Mrs. Harriet Frizzell and modified by Dr. Alex. Petrunkevitch in "A Study in Amber Spiders," Trans. Conn. Acad., 1942, 34, p. 137. The lower figure represents the length of the leg divided by the length of the carapace.

distal joints darker, femora with a dark anterior lateral line, much fainter on the posterior pairs, all joints with rows of small hairs, no spines, tarsal comb of 6 or 7 curved bristles on the fourth metatarsus; *palpus*, large for the size of the spider, shorter than the cephalothorax, femur pale and bent, other joints dark, patella short and much swollen on the dorsal side, tibia very small and pressed close to the cymbium, palpal organ short, barrel-shaped, embolus probably a short black spine at the tip.

Holotype: ♂ Texas; Dallas, on the outside of a house, 9 July 1936, (Jones); in MCZ.

A CORRECTION.—In *Pysche*, Vol. 56, No. 1, I published a synonymic list involving some species in *Pseudomyrma* and other genera of ants (pp. 41–49). On page 43 occur two errors, the first of which was made at the printing office *after* the page proof had been read by both author and editor. Page 43, line 5, should read “*Pseudomyrma spinicola* subsp. *infernalis*”, not “subsp. *sclerosa*.” Line 9 on the same page mistakenly omits an “e” from “subsp. *scelerosa*”, the latter being Wheeler’s original spelling. Enzmann’s transcription of the name was “*sclerosa*”.—W. L. BROWN, JR., Biological Laboratories, Harvard University.

A NOTE ON *PHEIDOLE* (*MACROPHEIDOLE*)
RHEA WHEELER (HYMENOPTERA:
FORMICIDÆ)

By ROBERT E. GREGG

Department of Biology, University of Colorado

This species was described by Wheeler (1908), from a single, very large, dealated female collected at Nogales, Arizona. Though later synonymized (Wheeler, 1915), with *Pheidole fimbriata* Roger of tropical America, M. R. Smith (1943), has reviewed in detail the status of *Pheidole rhea*, drawing pertinent distinctions between it and *fimbriata*. He has shown that *rhea* deserves specific rank, and has provided a description of both the soldier and the worker castes.

Through the assistance of Mr. L. F. Byars and Mr. J. B. Zuck, I have received a large series of specimens of *Ph. rhea* from the type locality, representing all castes with the exception of the males. The ants were obtained at different periods from the same colony located near the top of a dry hillside on Washington Drive, Nogales, Arizona. The site was characterized by very rocky soil originally covered with coarse desert grasses and weeds. Fortunately, my wife and I were able to visit the spot in April, 1948, and collect additional material before the nest was completely destroyed by landscaping. It was first discovered under a stone, but had moved after being disturbed. The total number of specimens secured are as follows, according to caste: 201 soldiers, 262 workers (media), and 274 workers (minima). The species is highly polymorphic, and for convenience several size classes of individuals are grouped as media, although no sharp gaps are detectable in the series from largest to smallest individuals. One dealated female was captured by Mr. Zuck from under a stone, and though isolated, is believed to have come from the same nest as

the above series. Dates on which the ants were obtained are March 2, 1947 (wingless female), June 18, 1947; March 29, April 10, April 14, and April 25, 1948. Besides these specimens, a few soldiers and numerous workers have been added to our collection from Colossal Cave State Park, southeast of Tucson, Arizona, which we visited on April 20, 1948. The ants were collected as they foraged for the seeds of various desert plants near the entrance to the cave.

On comparing my material with the detailed descriptions published by Smith for the soldier and worker of *rhea*, it seemed that a new form of the species might be recognized, especially in view of the much greater size of the soldiers in my samples and certain differences in the queen. However, after studying specimens from the Pinal Mountains and the Santa Catalina Mountains of Arizona (sent respectively through the courtesy of the United States National Museum and the Museum of Comparative Zoology), the variability of the species noted by Smith is fully confirmed, and it is impossible to discern adequate bases for erecting a new subspecies at this time. Nevertheless, it is desirable to record certain features of my Nogales specimens which depart from the published accounts.

The great variability and continuous gradation in size from the smallest to the largest individuals makes it difficult to distinguish *rhea* from other species if only the smaller intermediates are available, although its long epinotal spines should suffice. The upper size limit of the soldier has been uncertain, and Smith gives 5.5 mm. as the size for the soldier in his description. He does mention, though, an unusual soldier from Escuinapa, Mexico, which is 8 mm. The soldiers which I have measured reach 9.8 to 10.2 mm. in the largest size class, and may be regarded as the probable upper limit since they approach the queen which is 14.3 mm. (Wheeler). This increase over the 8 mm. linear dimension noted by Smith, is accentuated by the allometric growth in proportions of the head which accompany it, rendering the soldiers quite huge. The width of the soldier head varies from

3.3 mm. to 3.7 mm., while its length, excluding the mandibles, varies from 3.6 mm. to 4.0 mm. All possible intermediates connect the soldier with the smallest worker which measures 3 mm. (Smith), or 4 mm. among my material.

Ph. fimbriata is furnished with tufts of short, dense, erect hairs on the under surfaces of the petiole and postpetiole, while these are absent on *rhea* (s. str.). The ants before me show a few, spaced hairs in those positions. Also, some of the intermediate sizes possess a slender, acute, erect spine on the ventral aspect of the petiolar peduncle, and others show an aborted spine, while most have only a slight elevation. The eyes of the *rhea* soldier have 15 facets, according to Smith, but my examples show only 13 to 14 facets; *fimbriata* has 11 or 12. The color of the largest soldiers and some of the intermediates is somewhat lighter than that indicated in the description, or of those received for study; it is distinctly red on the middle and posterior portions of the head, though the thorax and abdomen are brownish to black.

The single specimen of wingless female in my possession differs also from Wheeler's description of the type, and is probably another indication of the considerable variation to which the species is subject. The head is distinctly broader than long (exclusive of the mandibles), and the posterior border of the orbit is precisely at the middle of the head, rather than in front of it. The clypeus has an obvious median elevation or carina, and a broad, shallow emargination, opposite to the condition of these structures in Wheeler's specimen. The thorax through the wing insertions is as broad or broader than the head through the posterior corners (narrower in *rhea*), the petiole is subquadrate rather than suborbicular, and the mesonotum is not shagreened, but very smooth and shining with a few striations near the middle of the posterior border and on the sides of the anterior border. The gaster is distinctly shagreened and feebly shining. In size, this ant is 14 mm., and therefore not quite as long as Wheeler's specimen.

In view of the fact that Wheeler described *rhea* from a lone female, the marked variability of the other castes subsequently obtained, and the lack of females definitely known to be from the same colony as the series of soldiers and workers in the Nogales nest, it is advisable to withhold description of a new form unless indicated otherwise by additional material.

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EPICAUTA DIVERSICORNIS AND ITS ALLIES
IN THE NEOTROPICAL REGION
(COLEOP., MELOIDÆ)¹

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Epicauta diversicornis and related species form a closely-knit group which can be defined as possessing the following characters in the male. Posterior tibiæ with a row of short teeth internally at the apex. First two antennal segments enlarged, denuded except for scattered erect setæ, and shiny, the first not excavated externally at the tip. Anterior tibiæ with a single spur and anterior tarsi with the first segment flattened, usually shiny and expanded.

All of the known species in the group are moderately slender and almost uniform in width (see figure in Champion, 1892). Except for size and color there is great similarity in all the species. None has been seen less than ten millimeters long or more than twenty. Females can be known by the distinctive shape and usually can be placed by color and locality. All the species have a small scutellar and humeral spot on the elytra when fully marked. There are several species outside the group which have females similar to those in the group so that caution should be observed when making determinations.

Attention should be called to the variation that occurs in the width of the first two antennal segments of the male. An example is shown in figures 4 and 5, both of *diversicornis*. This much variation occurs also in *isthmica* and probably in the other species with these segments flattened.

All the known species of *Epicauta* with the posterior tibial comb are restricted to the region from Southwestern

¹ Published with a grant from the Museum of Comparative Zoology at Harvard College.

United States to Guiana and Colombia. The *diversicornis* group is interesting in that it contains the only species known to occur in South America.

A key to the males of the known species follows. Except where noted, all specimens on which ranges are based have been examined by the author.

1. First antennal segment triangular in cross-section, with three almost flat surfaces 2
 First antennal segment flattened or oval in cross-section, with at most two flat surfaces 4
2. First tarsal segment slightly longer than second, with uniform sparse pubescence. Antennæ as in figure 2. Brown, clothed with cinereous pubescence, which is denser in a line down each elytron. *Mexico*: Nayarit (Tepic), Morelos (Cuernavaca), Yucatan (Chichen Itza) *E. forticornis* (Haag), 1880
 First tarsal segment shorter than second, denuded, shiny 3
3. First two antennal segments equal to rest in length. Black, the elytra luteous, uniformly clothed with cinereous to luteous pubescence. *U.S.*: Texas (Val Verde Co. to El Paso Co.), New Mexico (southern), Arizona (Douglas, Sta. Catalina Mts.). *Mexico*: Nuevo Leon (Monterrey) *E. polingi* Werner, 1943
 First two antennal segments longer than the rest. Brown, with the margins of the elytra paler and with paler pubescence. *U.S.*: Arizona (Maricopa Co. to Gila Co.). *Mexico*: Sonora (Imuris).
 E. liebecki Werner, 1943
 First two antennal segments shorter than the rest. Brown to luteous, with uniform cinereous pubescence. *U.S.*: Arizona (Maricopa Co. to Cochise Co.). *Mexico*: Sonora (Arizpe)
 E. arizonica Werner, 1943
4. Second antennal segment distinctly more than half as long as first. Fig. 1 and fig. 3 5
 Second antennal segment half as long as first or shorter. Fig. 4 to fig. 8. 6
5. First segment of anterior tarsi longer than second, not expanded and with at least scattered pubescence.

Antennæ as in fig. 1. Body brown, elytra luteous, with uniform pale pubescence. *Mexico*: Jalisco (Guadalajara), Nayarit (Tepic, fide Dugès), Morelos (Cuernavaca) *E. humeralis* (Dugès), 1889

First segment of anterior tarsi shorter and broader than second, partly denuded and shiny. Brown, with the margins of the elytra paler and with a fringe of denser pubescence. Antennæ as in fig. 3. *Guiana* fide Erichson, *Venezuela* (Las Trincheras), *Colombia* (Amaya-Cispata Bay), *Panama* (Ft. Clayton, C.Z.) [= *Lytta intermedia* Haag, 1880]

E. flagellaria (Erichson), 1848

6. Second antennal segment distinctly longer than the following three. Fig. 4 and fig. 5. Black or dark brown, the elytra luteous. First segment of the anterior tarsi subequal to second, slightly expanded, shiny. *Mexico*: Sinaloa (Mazatlan, Venodio), Nayarit (Tepic), Jalisco (Guadalajara), Michoacan (Apatzingan), Hidalgo (Pachuca), D.F. (Mexico City), Morelos (Cuernavaca), Guerrero (Acapulco), Vera Cruz (Cordoba). [= *Macrobasis flavens* Dugès, = *Macrobasis diversicornis*, Champion, in part.]

E. diversicornis (Haag), 1880

Second antennal segment at most slightly more than equal to the following two. Fig. 6 to fig. 8. 7

7. Second antennal segment slightly longer than the following two. First segment thickened, oval in cross-section. See fig. 6. Dark brown to black, with the margins of the elytra fringed with pale pubescence. Averaging smaller than *diversicornis* and the other species in the group in its region. *Mexico*: Durango (Canelas, fide Dugès), Jalisco (Colima Vulcano), Nayarit (Tepic). *E. beckeri* (Dugès), 1889

Second segment of antennæ slightly longer than the following two. First segment flattened. See fig. 7. Dark brown, with uniform pale to dark pubescence. As small as *beckeri*, usually less than 12 mm. *Guatemala* (Guatemala City), *Mexico* (Chiapas), *Salvador* (Sta. Ana). *E. candèzi* (Haag), 1880

Second segment of antennæ only slightly longer

than the third. See fig. 8. Middle tarsi with a fringe of long hairs along the inside. Panama to Vera Cruz. *E. isthmica* sp. n.

Epicauta isthmica sp. n.

Length: 10 to 20 mm. Body black, elytra brown to luteous; legs except for tarsi, palpi, labrum, labium and clypeus luteous. Pubescence uniform, moderately dense, decumbent, cinereous to pale luteous. There is a dark scutellar and humeral spot, dark pubescence on the tarsi (some pale pubescence at the base of the first segments) and on the tips of the femora and outer edge of the tibiae. No dark pubescence on the abdominal sternites except on the apex of the fifth. Any of this dark pubescence may be greatly reduced or even absent.

Head subquadrate; eyes prominent, transverse, excavated but moderately broad, four-sevenths as long as broad at the broadest place when seen from the side, separated dorsally by an area slightly narrower than their greatest width. Surface of head densely but finely punctured, uniformly, densely microreticulate. Antennal calyces narrow, denuded, without punctures. Median impressed line distinct down to the level of the eyes, not augmented by a denuded border. Mouth parts except for mandibles luteous. Last segment of maxillary palpi quite narrow, half as long as wide at the widest place, two-thirds from the base. Male antennae as in figure 8 or with the first two segments broader or slightly narrower, the first two segments black to luteous. Female antennae as in *diversicornis* but with the second segment slightly shorter than the third.

Pronotum narrower than head, one-third longer than broad. Sides roughly parallel for the basal three-fourths, then converging at a sixty degree angle, the side slightly arcuate and the change in angle not abrupt. Basal impressed line distinct. Median impressed line fine but distinct. Surface more densely punctured than on head. Scutellum black. Elytra brown to luteous, with the luteous form more prevalent in the northern part of the range.

Underside uniformly pale pubescent, except for the apical half of the fifth abdominal sternite. The apices of the abdominal sternites have a fringe of slightly denser pubescence so that they appear indistinctly margined.

Anterior tibiae of male denuded externally, with one straight, spiniform apical spur. First segment of male anterior tarsi denuded except for a few hairs along the outer margin and apex, shiny, expanded on the inner margin, concave behind. Middle tarsi of male with a fringe of long erect black hairs along the inside. Each hair of this fringe is as long as the fourth segment. Posterior tibial spurs expanded spiniform, the outer shorter than the inner.

Holotype: ♂, Cabima, Panama May 28, 1911 A. Busck (USNM)

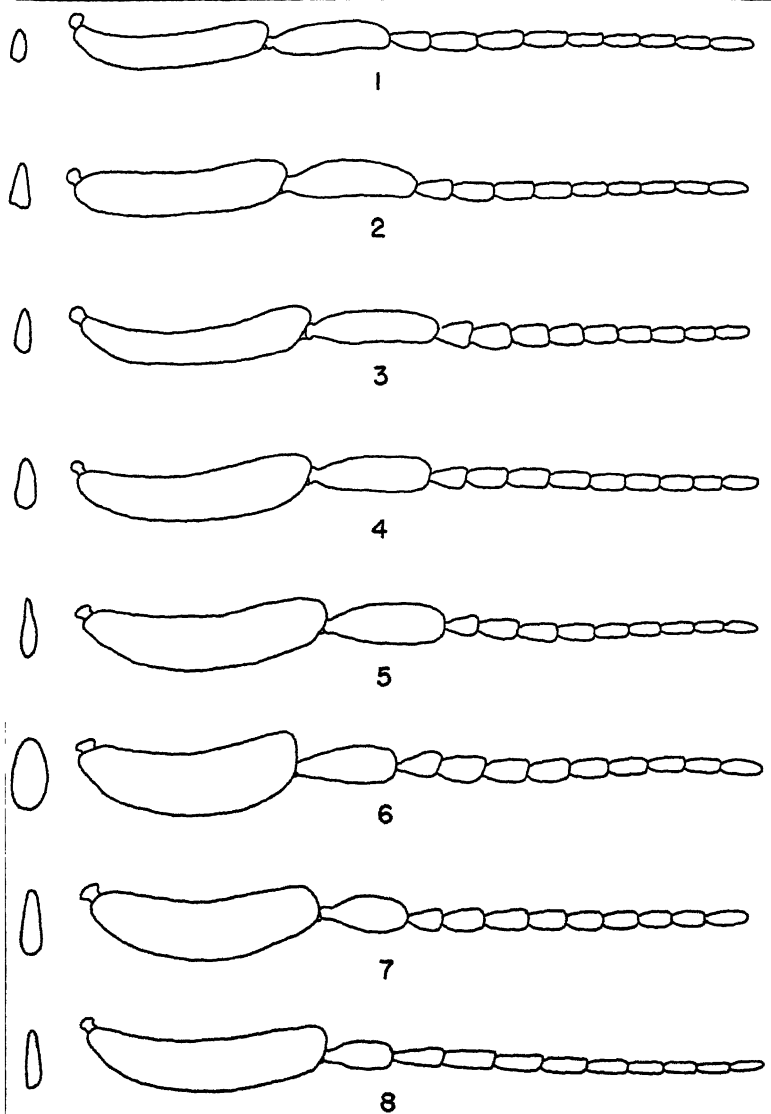
Allotype: ♀, eutopotypical (USNM)

Paratypes: Panama: 7♂♂, 6♀♀, topotypical (USNM); 2♂♂, Bocas del Toro (USNM); 2♂♂, 1♀, Taboga I. (USNM); 2♀♀, La Chorrera (USNM); 4♂♂, 4♀♀, La Chorrera (Cal. Ac.); 1♂, 3♀♀, St. Maria, El Real (MCZ); 2♂♂, 2♀♀, Sta. Rosa (Chic. N.H.M.); 1♀, Panama (MCZ). Canal Zone: 4♂♂, 3♀♀, Madden Dam (Cal. Ac.); 6♂♂, 5♀♀, Madden Dam (Cal. Ac.); 5♂♂, 2♀♀, Ft. Clayton (Cal. Ac.); 1♀, Gamboa (Cal. Ac.); 2♂♂, Ancon (Chic. N.H.M.) 1♂, 1♀, Ancon (Ohio); 1♀, Ancon (USNM); 1♀, Culebra (Ohio); 3♂♂, Barro Colorado I. (USNM); 1♂, 1♀, Paraiso (USNM); 1♂, Tabernilla (USNM); 1♀, Alhajuelo (USNM); 1♀, Canal Zone (USNM). Costa Rica: 3♂♂, 2♀♀, Bebedero, Guanacaste (USNM); 1♂, 1♀, Santa Elena, Guanacaste (USNM); 1♀, Guanacaste (USNM); 1♂, Sarchi (USNM); 2♂♂, 1♀, Port Parker (Cal. Ac.); 2♀♀, Costa Rica (Chic. N.H.M.). Nicaragua: 1♀, Managua (USNM). Honduras: 1♂, 1♀, La Libertad, Comay (MCZ); 1♂, San Pedro S. (Chic. N.H.M.). Salvador: 1♂, Santa Ana (USNM). British Honduras: 1♀, Punta Gorde (Parker). Mexico: 2♂♂, 3♀♀, La Gloria, Cardel, Vera Cruz (USNM); 2♂♂, 2♀♀, Atoyac, Vera Cruz (USNM).

EXPLANATION OF PLATE 5

Male antennæ. Cross-section of first segment on left.

- Fig. 1. *Epicauta forticornis* (Haag)
- Fig. 2. *Epicauta humeralis* (Dugès)
- Fig. 3. *Epicauta flagellaria* (Erichson)
- Fig. 4. *Epicauta diversicornis* (Haag)
- Fig. 5. *Epicauta diversicornis* (Haag)
- Fig. 6. *Epicauta beckeri* (Dugès)
- Fig. 7. *Epicauta candèzi* (Haag)
- Fig. 8. *Epicauta isthmica* sp. n.



A NEW AMERICAN *AMBLIOPONE*, WITH NOTES
ON THE GENUS (HYMENOPTERA:
FORMICIDÆ)¹

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Amblyopone (*Stigmatomma*) *trigonignatha* new species

Figure 1

Holotype worker: Total length measured from lateral profile, mandibles included but sting excluded, $6.12 \pm .10$ mm.; Weber's length of alitrunk, $1.60 \pm .05$ mm.; maximum measurable length of the head from the center of the anterior clypeal border to a line connecting the posterior extremities of the occipital corners, $1.22 \pm .005$ mm.; maximum width of head, $1.05 \pm .005$ mm.; cephalic index, 86 ± 1 ; left mandible, straightline distance, when closed, from the point of contact with the anterior border of head to apex, $0.80 \pm .01$ mm., or, more roughly, about two thirds of the length of the head proper.

Head a little more slender than in *A. (S.) pallipes* (Haldeman), sides gently convex, greatest width at about the anterior third, slightly convergent behind and passing into the rounded occipital corners through easy curves; posterior border of head moderately but distinctly concave in outline. "Amblyoponine teeth" at the anterolateral corners of the head reduced to small, bluntly rounded tubercles which are more or less hidden in dense pilosity; this reduction much greater than in any small specimens of the *pallipes* complex I have seen. Clypeus dorsally weakly convex, its anterior apron rather narrow, with a very feebly convex anterior border which appears straight at some angles of view. This apron is rather abruptly terminated on each lateral extremity by an angle which marks the boundary between

¹ Published with a grant from the Museum of Comparative Zoology at Harvard College.

it and the medial wall of a notch which receives the acute, triangular basal mandibular tooth. Anterior margin of clypeal apron set with twelve small, regular separated denticles which are truncate, subcylindrical and not socketted on subconical tubercles as are those of *pallipes* and its subspecies, also one of these tubercles on each short lateral margin. This makes 14 denticles in all, more than in *pallipes*, all separate, smaller and more regular than in the *pallipes* complex, and with the exception of the tooth on each lateral margin, on approximately the same level. Eyes about the same size and in the same

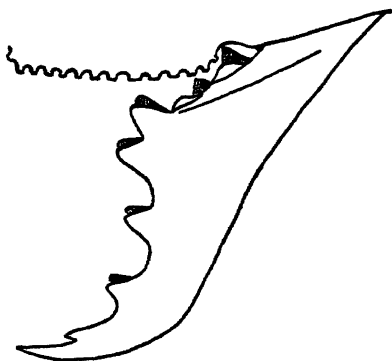


Figure 1. *Amblyopone* (*Stigmatomma*) *trigonignatha* new species, worker, left mandible and anterior clypeal border.

position as in medium-sized *pallipes* workers, with only 3 or 4 of the facets actually pigmented in each. A faint median depression on the cephalic dorsum at about the midlength evidently represents a vestige of the anterior ocellus.

Mandibles distinctive; considering only the basal halves each forming an obtuse triangle, with the inner border of the basal part just before the midlength distinctly angulate at somewhat more than a right angle; this angle, which is capped by two massive, blunt double teeth partially fused at their bases, marks off fairly distinct basal and apical borders. The basal border bears two rows of teeth, a dorsal and a ventral; there are two teeth in each row, the ventral ones triangular,

acute, the dorsal low and rounded and alternating with the ventral ones so that all may be seen from a position directly dorsad. The more basal of the two ventral teeth is the larger, and this fits into the notch mentioned above just lateral to the clypeal apron. The apical border distad of the two large double teeth at the angle with two more blunt, massive double teeth, which are well separated; these followed by a smaller acute tooth just before the acute, stoutly spiniform apex. Seen from the side, the mandibles are nearly twice as thick dorsoventrally as in *pallipes*, and not quite so strongly projecting anteriorly; the apices somewhat recurved.

The alitrunk is very similar to that of small *pallipes* workers, but perhaps very slightly more slender; the rounded lamellæ at the base of the propodeal declivity smaller. The petiolar node is very slightly longer than broad seen from above, much as in smaller workers of *pallipes*.

Sculpture throughout less pronounced than in *pallipes*, the head and thorax shining to the naked eye. Seen at very high magnifications, the dorsum of the head is sown with very small, regular punctures which are separated from each other by plane, shining surfaces which do not form the fine longitudinal costulation or rugulation seen in the forms of *pallipes*. Clypeus very indistinctly and irregularly longitudinally striate; mandibles striate longitudinally as in *pallipes*, but less regularly and distinctly. Sculpture of dorsum of alitrunk much like that of the head, but the sides posteriorly are longitudinally striate as in *pallipes*; propodeal declivity with a large central area devoid of transverse striæ and smooth and shining.

Color rather uniform medium ferrugineous. Other characters of structure and pilosity within the range of variability shown by small to medium-sized *pallipes* workers from the eastern United States. Male and female unknown.

Holotype worker, Museum of Comparative Zoology, Harvard University, Catalog No. 28231. Collected at Concord, North Carolina, by Dr. D. L. Wray, who sifted

it from leaf mold by means of the Berlese funnel. One *Stigmatomma pallipes* worker was also taken by the same funnel, a fact which has caused me to examine a large quantity of *pallipes* specimens in making sure that the new species cannot be an extreme example of the very variable common species. I have found it very generally true that closely related ant species often occur in the same Berlese batch, especially with forms living in or beneath the soil cover or in rotten logs, so the proximity of the two forms in collecting need not trouble us too much. The differences are so striking that I cannot consider *trigonognatha* as merely an abnormal specimen of *pallipes*, and the sting rules out the possibility of it being an ergatoid male like those found in *Ponera*.

Amblyopone (Stigmatomma) pallipes (Haldeman)

Typhlopone pallipes Haldeman, 1844, Proc. Acad. Nat. Sci. Phila., 2: 54, worker.

Stigmatomma pallipes subsp. *montigena* Creighton, 1940, Amer. Mus. Novit., No. 1079, p. 7, figs. 6 and 8.

The remainder of the synonymy is given in Creighton's paper cited above on page 3. The correct spelling of Provancher's name is *Arotropus binodosus*, not "*Atropus binodus*," as Creighton has it.

Since Dr. Creighton's paper describing the form *montigena* was published, I have been accumulating *Stigmatomma* specimens year by year from various states, principally Pennsylvania, North Carolina and Tennessee. I have looked over specimens from the Pennsylvania Alleghenies (where *Stigmatomma* is often the most abundant or *only* ant occurring in very wet mountain valleys in which rhododendron and hemlock form the main cover) with the hope of finding *montigena* specimens. I succeeded in finding some specimens with a rather convex anterior clypeal border, but these were often mixed in the same colony with specimens having the border nearly straight. Two specimens from rich, low beech woods in a city park in Philadelphia, however, showed very marked convexity of the clypeal border to a degree comparable with the *montigena* types; since these latter

specimens were taken in very close association with several other workers having much less convex borders, I believe that the geographical basis of this subspecies becomes very weak. The length of the funicular joints, the sculpture, and the presence or absence of a tubercle distad of the basal tooth are also variable characters in both Pennsylvania and North Carolina specimens, and the first of these auxiliary characters is subject to differences brought about by the contraction of funicular joints into one another to different degrees at death in alcohol. In conclusion, Dr. Creighton's material, while reasonably abundant, just happened to show a distributional pattern which led naturally to the erection of a subspecies. The additional material now available shows so many contradictory features that *montigena* cannot be retained as a separate form any longer.

Amblyopone (Stigmatomma) subterranea Creighton

I regard this form for the present as a good species, though it was described as a subspecies of *pallipes* in Creighton's 1940 paper (p. 8, fig. 4). Though the difference from *pallipes* is very slight, it seems constant in the specimens from Kansas, and the specimen from Austin, Texas, may also be considered as of this form instead of as a *pallipes-subterranea* intergrade. Buren has reported this form from Iowa, so the range appears wide in the plains states. Specimens of *pallipes* from Illinois and western Tennessee do not seem to intergrade with *subterranea*, and no true intergrades seem yet to have been reported from anywhere, with the exception of the single doubtful specimen from Texas. Though it is true, as Creighton states in his description, that most of the sculpture of *subterranea* is rather light, the Kansan and Texan specimens show rather characteristically strong longitudinal rugulæ in the area just behind the frontal region of the dorsum of the head which are not quite like those of *pallipes*. The structure of the anterior clypeal border seems rather distinct and diagnostic also.

Though Creighton regarded the single Arizona record of *Stigmatomma* as doubtful in 1940, there have been

several collections made in that state by Mr. R. G. Wesson since Creighton's writing. Dr. Creighton has suggested to me in a letter that these specimens may provide a basis for reviving Wheeler's Arizona race, but since these collections are not presently available to me, I shall provisionally accept the synonymy of this form under *S. pallipes pallipes*.

Subgenera of the genus *Amblyopone* Erichson

In 1934, Mr. John Clark of Melbourne¹ adopted Wheeler's earlier suggestion² that *Stigmatomma* Roger, *Fulakora* Mann and *Xymmer* Santschi were only subgenera of *Amblyopone* Erichson. On the basis of workers alone, it is hard to see why any of these names should be maintained if the known world fauna of the complex is considered as a whole. An examination of the venation of the winged males and females of several species referred at present to *Amblyopone* (*aberrans* Wheeler, several forms of the *australis-cephalotes* complex) and to *Stigmatomma* (*rothneyi* Forel, *pallipes* (Haldeman), *pallipes oregonensis* Wheeler) reveals a difference which, if consistent in the two groups, will serve to separate them satisfactorily as subgenera; I should not be surprised to find this character intergradient and thus not any longer separatory when more of the males and females are known. In *Stigmatomma*, the second free abscissa of Rs (Rs FA 2), the vein which splits the cubital cell longitudinally, is present in its entirety (somewhat weak in *rothneyi*), while in all the *Amblyopone sensu stricto*, this vein is entirely gone and the cubital cell resulting is very large and undivided. Furthermore, the venation of the *Stigmatommata* from the United States (not *rothneyi*) is more primitive in that the first free abscissa of M (M FA 1), the posterior part of the vein persistently called the "basal vein," is lined up or nearly lined up with crossvein cu-a, a condition characteristic of the Myrmecini and also of at least some *Mystrum* Roger and *Myopopone* Roger.

¹ Clark, 1934, Mem. Nat. Mus. Victoria, No. 8, p. 27.

² Wheeler, 1927, Proc. Amer. Acad. Arts & Sci. 63: p. 1.

I have not seen any winged forms of *Fulakora* Mann; this genus or subgenus cannot at present be separated from *Stigmatomma*, since the prime character, approximation of the frontal carinæ, is intermediate through to *S. williamsi* Wheeler (Philippines) in at least two Australian forms of *Fulakora* described by Clark (*punctulata*, *gracilis*). *Williamsi* and *silvestrii* Wheeler (Japan) form a very close series connecting forms like *punctulata* with those like *denticulata* Mayr and other "typical" *Stigmatomma*. In the absence of evidence to the contrary, I propose that the name *Fulakora* Mann be considered a synonym of *Amblyopone* (*Stigmatomma*).

Two synonyms were unwittingly created by Wheeler (see synonymy below) when he stated that he thought the use of Clark's names, proposed *in lit.* at an earlier date, to be "inadvisable." Both names were put in print, with genotypes stated. According to present practice as employed by many systematists, these names are available and in force, a fact pointed out to me by my friend, Mr. Floyd G. Werner. It appears best to list them formally as synonyms. The arrangement below shows my conclusions as to the relationships of the names discussed above. For fuller synonymy, references can be found in Emery's section on the Amblyoponini in the *Genera Insectorum*.

Genus *Amblyopone* Erichson

Erichson, 1841, Arch. Naturg., 8: 254, 260.

Neoamblyopone Wheeler, 1927, Proc. Amer. Acad. Arts and Sci., 62: 1.

Protamblyopone Wheeler, Idem., p. 1.

As far as I can see, there is only one valid subgenus in addition to *Amblyopone* (s. str.):

Subgenus *Stigmatomma* Roger

Roger, 1895, Berlin. Ent. Zeitschr., 3: 250.

Stigmatomma (*Xymmer*) Santschi, 1914, Boll. Lab. Zool. Portici, 8: 311.

Ximmer Emery, 1919, Ant. Soc. Ent. Belg., 59: 106, as subgen. of *Stigmatomma*.

Fulakora Mann, 1919, Bull. Mus. Comp. Zool., 63: 279, subgen. of *Stigmatomma*.

Amblyopone (*Xymmer*) Clark, 1934, Mem. Nat. Mus., Melbourne, No. 8, p. 27.

A. (*Stigmatomma*) Clark, 1934, Idem., p. 27.

A. (*Fulakora*) Clark, 1934, Idem., p. 27 *et suiv.*

Since both Santschi and Emery have shown (works cited in synonymy) that Santschi's *Xymmer muticum* is connected to *Stigmatomma* through *A. (S.) belli* Forel, I can see no reason for retaining *Xymmer* as a separate subgenus any longer.

NORTH AMERICAN MENOPONIDÆ (MALLOPHAGA). III; NOTES ON SOME OF
KELLOGG'S TYPES

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Kellogg in his numerous papers on Mallophaga described many new North American species. The taxonomic importance of the male genitalia was unknown to him, and a large number of his host records have been proven incorrect. The latter item, particularly, has led to great confusion; the only solution has been to remount and examine his type specimens.

His types in many instances have proved to be immature specimens of known species. For such instances indicative of incorrect host designation, records of the correct host with the same date and locality information can be found leaving little doubt that the hosts were not kept separated in the game bag.

Hopkins has presented an interesting discussion on synonymy of Mallophagan names, and the author agrees with his views. The purpose of this paper is not to discuss the validity of certain forms sometimes referred to the names listed, but the validity of those names.

The author wishes to acknowledge the kindness of Dr. G. F. Ferris in lending the Stanford University Collection containing V. L. Kellogg's type material, and of Mr. G. H. E. Hopkins of the Tring Museum and Miss Theresa Clay of the British Museum for their help and criticisms.

Colpocephalum abbotti Kellogg 1899 = *Actornithophilus lari* (Packard 1870). The type is an immature specimen, and the correct host is probably *Larus* sp.

Colpocephalum fumidum Kellogg 1896 = *Actornithophilus lari* (Packard 1870). The type is an immature specimen, and the correct host is probably *Larus* sp.

Colpocephalum grandiculum Kellogg and Chapman 1899 = *Actornithophilus lari* (Packard 1870). The type is an immature specimen, and the correct host is probably *Larus* sp.

Colpocephalum patulum Kellogg and Kuwana 1900 = *Actornithophilus bicolor* (Piaget 1880). Absolute synonymy.

Menopon striatum Kellogg 1899 = *Amyrsidea lagopi* (Grube 1851). Absolute synonymy.

Menopon irrumpens Kellogg and Chapman 1899 = *Austromenopon navigans* (Kellogg 1896). Absolute synonymy; with each sex being described as a different species.

Menopon petulans Kellogg and Chapman 1899 = *Austromenopon paululum* (Kellogg and Chapman 1899). *M. paululum* was described from male specimens collected from the Black-vented Shearwater, *Puffinus opisthomelas* Coues; the Sooty Shearwater, *Puffinus griseus* (Gmelin); and the Pink-footed Shearwater, *Puffinus creatopus* Coues. I designate as lectotypes the types collected from *Puffinus griseus* (Gmelin). *M. petulans* was described from a single female specimen collected from the Sooty Shearwater, *Puffinus griseus* (Gmelin). The types of both species were collected on the same day from the same locality. An examination of the types proved them to represent only a single species with the name *paululum* having page priority.

Colpocephalum laticeps Kellogg 1896 = *Ciconiphilus obscurus* (Giebel 1874). Absolute synonymy, and the latter name may prove to be a synonym of *Ciconiphilus decim-fasciatum* (Boisduval and Lacordaire 1835).

Menopon decoratum Kellogg 1896 described from specimens taken from the White-tailed Kite has led to a great deal of confusion. The correct host for this species is the California Cuckoo, *Coccyzus americanus occidentalis* Ridgway; and the correct name should be *Cuculiphilus decoratum* (Kellogg 1896). This species is distinctly different from *Cuculiphilus fasciatus* (Scopoli 1763), which probably does not occur in North America.

Menopon galapagensis Kellogg and Kuwana 1902 = *Cuculiphilus snodgrassi* (Kellogg and Kuwana 1902). Absolute synonymy, and the correct host is *Coccyzus melacoryphus* Vieillot.

Menopon longicephalum Kellogg 1896 = *Menopon galinae* (Linnæus 1758). Absolute synonymy.

Menopon mesoleucum americanum Kellogg 1896 = *Myrsidea interruptus* (Osborn 1896). Absolute synonymy.

Menopon titan impar Kellogg 1896 = *Piagetiella peralis* (Leidy 1878). Absolute synonymy.

Menopon titan linearis Kellogg 1896 = *Piagetiella bursa-pelecani* (Perry 1876). Absolute synonymy.

Ferris has stated that *Menopon tridens pacificum* Kellogg 1896 could not be separated from *Pseudomenopon tridens* (Burmeister 1838). The author has compared Kellogg's material of *M. tridens insolens*, *M. tridens par*, and a slide labeled "var C" with specimens of *P. tridens* (Burmeister 1838) collected from *Fulica atra atra* (Linnæus) and believes them to be the same. The forms were separated only on size; but in any large series from the American Coot, *Fulica americanus* Gmelin, forms representing all of Kellogg's sub-species can be found.

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PSYCHE

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ADDITIONS TO *EPICAUTA*, WITH NEW SYNONYMY AND A CHANGE OF NAMES (COLEOPTERA: MELOIDÆ)¹

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The numerous specimens of *Epicauta* which have been made available to the author in the past two years have included several new species from the United States and Lower California as well as specimens which indicate that some of the former conclusions regarding our species were erroneous. The most important changes are included in this paper. The author owes a debt of gratitude to the curators of almost all the major museums in North America for their generosity and especially to Mr. Frank H. Parker and Mr. G. P. Mackenzie, who have been most free with specimens from their private collections and with information of real value in understanding the limits of some of our species.

The arrangement followed is that of my former paper on the genus, and changes that will have to be made in the key to species and in descriptions will be noted in their proper places under the species concerned.

Epicauta tenebrosa sp. n.

Epicauta pedalis, Horn, 1873, Proc. Am. Phil. Soc. 13: 99 (in part). Werner, 1945, Bull. M. C. Z. 45: 440 (in part).

Arizona specimens which have been assigned to *Epicauta pedalis* Lec. should be referred to this species. The

¹ Published with a grant from the Museum of Comparative Zoology at Harvard College.

California Academy series of *pedalis* from Lower California, the type locality, shows that there is a constant difference between the Lower California and Arizona specimens. From *pedalis*, *tenebrosa* can be distinguished in either sex by the lack of a pale sutural margin on the elytra and by its smaller size. The males have much more slender antennæ and have the tip of the ædeagus of a different shape. (Fig. 1.)

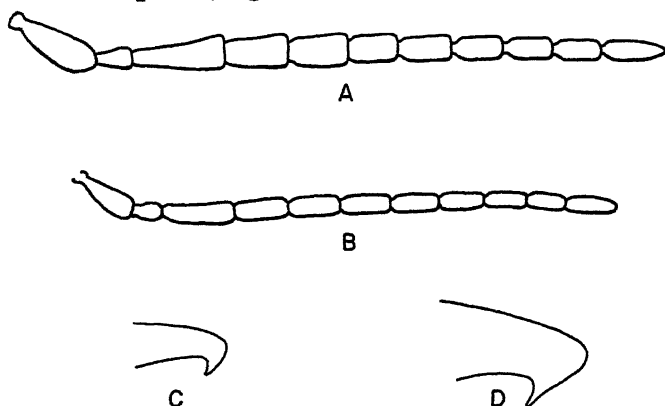


Fig. 1. A. Antenna of *Epicauta pedalis* Lec., male. B. Antenna of *Epicauta tenebrosa* sp. n., male. C. Tip of ædeagus of *Epicauta pedalis*, male. D. Tip of ædeagus of *Epicauta tenebrosa*, male.

Length: 8 to 10 mm. Black, moderately densely clothed with decumbent pubescence, which is tan on the elytra, paler on the head and pronotum and cinereous on the underside. Legs pale brown. Head subquadrate, with moderately dense and deep punctures, distinctly microreticulate on the intervals. Suture very distinctly impressed. Antennal calluses small, denuded, shiny. Eyes prominent, transverse, slightly wider than in *pedalis*. Antennæ in both sexes quite slender, tapering, reaching almost to the middle of the elytra, two and four-fifths times as long as an anterior tibia. First segment slightly thickened, reaching halfway across the eye; second short, three-sevenths as long as the first; third slightly longer than first; fourth four-fifths as long as third; succeeding segments decreasing slightly in length and width. The

third and following segments are just perceptibly flattened, especially in the male.

Pronotum as broad as long, subquadrate, with the sides parallel for the basal three-fourths, then converging at a forty-five degree angle, with the anterior angles rounded. Surface like that of head. Midline distinctly impressed and narrowly denuded. Basal impressed line distinct but not denuded. Elytra with a narrow denuded zone across the base, where normally covered by the base of the pronotum. Tips of femora and tibiae and all of tarsi, except for a few hairs at the base of the basal segments, with dark brown pubescence. Anterior tibiae of male with a single stout, slightly incurved spur. Posterior tibial spurs slightly broadened and flattened, the outer broader and longer.

Holotype: ♂, Tucson, *Arizona* VII-30 (Fall Coll. M.C.Z. No. 28221)

Allotype: ♀, topotypical, VIII-1 (Fall Coll.)

Paratypes: Tucson, *Arizona*: 1♀ VII-21 (Fall Coll.), 1♀ VII-21 (Liebeck Coll.), 6♂♂, 6♀♀ Aug. 1935 Bryant (Parker). Sabino Canyon, Santa Catalina Mts., *Arizona*: 1♀ 7-14-32 E. D. Ball (Parker), 1♂, 1♀ 7-12-32 R. H. Beamer (U. Kansas), 1♂ VII-26-1948 F. Werner & W. Nutting, at light (Werner).

Tenebrosa runs to couplet 63 in my key. It can be distinguished from *pedalis* by the characters mentioned above and from *balli* by the normal mandibles and the presence of a single spur on the anterior tibiae in the male.

Epicauta bispinosa sp. n.

This is the third species to be discovered in the United States belonging to a very closely-knit group, composed of *E. maculata* (Say), *normalis* Werner and *bispinosa* sp. n. These all have the same color, form and markings and the females cannot be distinguished except by association with males. All have numerous denuded spots over the whole body and elytra and have the elytra covering the abdomen almost completely and not conspicuously bulging. The male of *maculata* has the last segment of the labial palpi expanded and suborbicular in outline and the

second segment also expanded, one short, incurved spur on the anterior tibiae and the first segment of the anterior tarsi padded almost to the base. The male of *normalis* differs from it in having unexpanded palpi and in having the pad confined to the apical third of the first anterior tarsal segment but is like it in having a single anterior tibial spur. The male of *bispinosa* has two slender spurs on the anterior tibiae as in the females of all three, has unexpanded palpi and the pad of the first anterior tarsal segment as in *maculata*. This combination of characters in the males is exactly like that of the female of any of the three species and it is only by the genitalia that the male can be distinguished from the females at all.

Length: 9 to 12 mm. Black, quite densely clothed with pale olive-cinereous to cinereous pubescence, with scattered denuded spots as in *maculata* (Say). Indistinguishable from *maculata* and *normalis* in shape, proportions and sculpture of head and pronotum. Antennae almost identical with those of *maculata*, which vary slightly in different sized specimens.

Holotype: ♂ 10 mi. E. of Sonoita, Sta. Cruz Co., Arizona, alt. 4800 ft., in grassland, Aug. 1, 1948. F. Werner, E. & W. Nutting. Feeding on leaves of *Chamaesaracha coronopus* (Dunal) A. Gray. (M.C.Z. No. 28219)

Allotype: ♀ eutopotypical (M.C.Z.)

Paratypes: 62♂♂, 9♀♀ eutopotypical, in U.S.N.M., Chicago Nat. Hist. Mus., U. Kansas, Cal. Acad., collections of F. H. Parker, G. P. Mackenzie and F. Werner.

In an area less than one hundred miles square in southeastern Arizona there occur no less than four distinct, apparently very closely related species in the *maculata* group (*maculata*, *normalis*, *bispinosa* and *nogales*). One would expect that if these species were interfertile a fair number of hybrid forms would occur. There has been no attempt made to cross one with another experimentally but so far no morphological evidence of hybridization has come under observation. It is within the realm of possibility that hybrids do occur, at least among the first three species, since there is no difference in habitus, all varying greatly in the size and number of denuded spots

and in body size so that unusual specimens might be overlooked in the field.

When one examines the distribution of the four species in Arizona, a region well-known for its diversity of habitat and life zones, he gets some clue as to the possible reasons for segregation. *E. maculata*, ranging across the Great Plains and even as far east as Ohio, extends its range westward south of the Rockies onto the Colorado Plateau, just north of the Arizona White Mts., where it is quite abundant, feeding on the leaves of a species of *Amaranthus* and *Salsola*. It also reaches the plateau to the north of the Huachuca Mts., where it is likewise abundant and feeds on the same or similar plants. On this plateau and nearby it is taken occasionally on *Solanum elaeagnifolium*. The specimens on this plant tend toward smaller spots and more luteous pubescence than most populations and may represent a separate race. A series collected by Mr. Parker at Phoenix was feeding on *Kallstroemia*. It does not seem to differ from normal specimens from other parts of the range.

The record of *E. normalis* is not as complete. It is found from the Rockies to the Sierras and seems to range farther north than *maculata*. It has been taken in the Chiricahua and Huachuca Mts. and at Willcox. No food plant records had been kept for these specimens. The Willcox series was mixed with *maculata* but no attempt had been made to segregate by food plant or exact locality. It seems possible that *normalis* usually is found at higher altitudes than its near relatives. Extensive collecting on the plateau in 1948 did not produce any specimens.

E. nogales has turned up only in or near the Santa Cruz river valley and it is quite evident that it must have a more extended range in the adjacent part of Mexico. The other species have not been taken in this valley.

The occurrence of the fourth species, *E. bispinosa*, on the plateau north of the Huachuca Mts. in an area where *E. maculata* also occurs abundantly, would be quite inexplicable were it not for some observations made at the time it was taken. Both species were abundant at a roadside stop 10 miles east of Sonoita. *Maculata* was feeding

on *Amaranthus* and *Salsola*, in considerable numbers. Under these plants were scattered patches of *Chamaes-racha*, a low solanaceous plant, which had *bispinosa* feeding on them. The species, as mentioned before, differ only in the male secondary sexual characters and several specimens were collected from both hosts before the differences were discovered. Then careful collecting by host plant revealed that out of 87 *maculata* and 63 *bispinosa* males not a single one was on the wrong plant. It can be safely surmised that the females show the same selection.

The question of expressing the known relationships in the taxonomy of the group is one to which the author has given considerable thought and which he has discussed with his colleagues in some detail. Dr. George Horn would probably have left at least the three very similar species as one, readily identifiable, species. This approach is particularly attractive to one who attempts to determine numerous museum specimens but is becoming increasingly indefensible as we attempt to apply the taxonomist's results to problems in the field.

Assuming that we attach names to all three forms, we still have at least two possible techniques, each with some merit. Using the extreme similarity of the three as a criterion, we can place them all in one species, with the typical and two other subspecies, with supposed geographical replacement. This view would be strengthened if *bispinosa* were found to have a wide range in northern Mexico and *maculata* not. It serves to point out the extremely great similarity of the three. It is weakened by the lack of evidence that the three hybridize where they meet, as in southeastern Arizona. We expect subspecies to be populations which have differentiated slightly behind barriers but which have not gone so far in differentiation that they cannot interbreed wherever they come together geographically.

The alternative method, and the one which the present author favors, is to call each a species. From the available evidence we have three geographically isolated species which show no tendency to interbreed. Where the ranges of *maculata* and *normalis* meet, along the front of

the Rockies, an altitudinal segregation acts and the same mechanism may act in Arizona where the ranges overlap. Where *maculata* and *bispinosa* overlap, or where one has differentiated from the other as the case may be, strict adherence to host plant specificity serves to segregate the two in the adult stage and present a barrier to interbreeding.

Present-day conditions in Arizona are exceedingly favorable for study of host specificity of *Epicauta*. A good proportion of the land is heavily grazed, the only comparatively untouched parts of many areas being along the main roads where the vegetation is protected by fences. Any adults of the herb-feeding species that emerge congregate on the roadside plants. A fairly high percentage of the individuals in the area must assemble here. Being parasitic and living in an area of uncertain rainfall, the number of individuals varies greatly from year to year. When a patch is found which supports blister beetles it usually has several species within a small area. Under such conditions one would expect any possible hybridization to occur. When none does occur, it is certainly an indication that there is some barrier, be it intersterility, micro-ecological isolation on host plants or even psychological.

Therefore the author maintains that the occurrence of *maculata* and *bispinosa* side by side on different food plants is a clear indication that they are distinct populations and since no intergrades have been found to indicate hybridization, prefers to treat them as species. At the same time, he feels certain that as more becomes known about both, this food plant isolation will be found not to be the primary factor in keeping the two separate.

Epicauta cinerea (Forst.)

Meloe cinereus Forster, 1771, Cat. Animals N. Am.: 62.

Lytta fissilabris LeConte, 1850, Agassiz Lake Superior 4: 232; 1853, Proc. Acad. Nat. Sci. Phila. 6: 339. (new synonymy)

Epicauta fissilabris, Horn, 1873, Proc. Am. Phil. Soc. 13: 102. Werner, 1945, Bull. M.C.Z. 45: 456.

LeConte described *fissilabris* from Lake Superior and Hudson's Bay Territory and since the time of its description very few specimens have been taken. These, however, show that there is a close relationship between it and *cinerea*. The author was unable to distinguish between the two species at the time he wrote his revision of the genus, except on the basis of color. Subsequent specimens indicate from their distribution that *fissilabris* is a marginal form of *cinerea*. It has been taken at Aweme, Manitoba; Tokio, North Dakota; Hope, Arkansas and Smithville and Stillwater, Oklahoma. These localities coincide fairly well with the northern and western limits of *cinerea*. The Arkansas and Oklahoma specimens were taken in company with normal *cinerea*.

Epicauta pestifera nomen novum

Epicauta marginata auct., nec Fabricius (in part).

Epicauta cinerea auct., nec Forster (in part).

Epicauta solani Werner, 1945, Bull. M.C.Z. 45: 457, nec

Epicauta Koehleri var. *solani* Denier, 1940, Rev. de la Soc. Ent. Argentina 10: 421.

It is hoped that at last our common margined blister beetle has a name that will stick with it.

Epicauta ficta sp. n.

This unicolorous grey species is most closely allied in our fauna to *cinerea* (Forst.), having similar antennæ but broad posterior tibial spurs. It differs from grey specimens of *pestifera* in its short, stout antennæ and from *brunnea* Werner by the broad posterior tibial spurs and unexpanded anterior tarsi in the male. It seems to be most closely related to *Epicauta obesa* from Vera Cruz on the Caribbean coast of Mexico.

Length: 9 to 12 mm. Black, densely clothed with decumbent cinereous to yellowish-cinereous pubescence. Antennæ short but of a form similar to those of *cinerea*.

Head subtriangular. Surface microreticulate, densely and rather deeply punctured. Midline very feebly impressed, usually not visible under low magnification. Antennal calluses small, slightly raised, denuded and

shallowly microreticulate. Eyes rather small, transverse, narrow, barely extending inwardly beyond the antennal sockets. Antennæ short, extending to just beyond the base of the elytra, twice as long as an anterior tibia. In the male the first segment is stout, the heaviest segment, reaching one-third across the eye; second slender, seventenths as long as first; third one-sixth longer than first, increasing gradually in thickness toward the apex where it is one and six-tenths times as wide as at the base. First two segments and base of third with cinereous pubescence. Fourth segment three-fifths as long as third; fifth and sixth equal to fourth in length, the apices of the third, fourth and fifth equal in thickness, wider than their bases. The length decreases gradually from the sixth to the tenth, which is five-sixths as long as the sixth. The sixth to the tenth are individually almost uniform in thickness. Last segment one and one-half times as long as tenth. The proportions are the same in the female except that the first and intermediate segments are not enlarged. Pronotum subquadrate, slightly longer than broad. Midline not impressed or denuded.

Elytra narrowly denuded and with a little black pubescence at the base where covered by the base of the pronotum. Outer margin of anterior tibiæ and top of anterior tarsi of male slightly denuded, the first tarsal segment slightly thickened. Posterior tibial spurs broadened, the outer slightly the broader and longer. In some of the males there is a small spot of black pubescence on the hind margin of the abdominal sternites and a mid-dorsal black line on the pygidium. This character is present in *obesa* and several other species in southern Mexico.

Holotype: ♂ Broken Bow, McCurtain Co., Oklahoma Aug. 27, 1931 M. L. Costner (M.C.Z. No. 28223).

Allotype: ♀ Smithville, Payne Co., Okl. Aug. 24, 1931 W. D. Davis (M.C.Z.).

Paratypes: Oklahoma: 3♂♂ eutopotypical; 3♂♂ Broken Bow Aug. 29, 1931 M. L. Costner; 1♀ Broken Bow Aug. 26, 1931 W. D. Davis; 1♂, 3♀♀ Smithville Aug. 24, 1931 W. D. Davis; 2♂♂ Idabel July 27, 1931 A. O. Elrod; 1♀ Stillwater Sept. 3, 1931 E. Hixon; 1♂ Stillwater Sept. 14,

1930 E. Hixon; 1♀ Stillwater Sept. 15, 1930 E. Hixon; 1♂ Stillwater Oct. 1, 1930 V. Laird; 1♀ Jay Jul. 5, 1931 M. L. Costner.

Paratypes deposited in the collections of the U.S.N.M., Cornell U., U. of Oklahoma and F. Werner.

Males with midventral spots on the abdominal sternites run to couplet 37 in the key but can be separated by the absence of scutellar and humeral spots on the elytra. The rest key to *solani* (*pestifera*) and can be separated by the short, heavy antennæ.

Epicauta senilis sp. n.

The combination of shaggy grey pubescence and pair of denuded callosities on the pronotum distinguish this species from all others in our fauna. Champion's *candidata* from Mexico has similar characters but has the outer posterior tibial spurs spoonshaped.

Length: 9 mm. Head broadly triangular, quite densely and moderately deeply punctured, with the intervals quite densely punctulate. Median impressed line distinct down to the level of the eyes, bordered by a narrow denuded area. Antennal calluses small, low. Eyes large, narrow, excavated next to the antennæ. Antennæ slender, twice as long as an anterior tibia. First segment slender, reaching three-fourths across the eye; second half as long as first; third just shorter than the first. The basal three segments with some short cinereous pubescence behind. Fourth and following segments two-thirds as long as third, gradually decreasing in thickness. Pronotum quadrate, conspicuously bulging on the disc. Median impressed line distinct, supplemented by a narrow denuded area. Basal impressed line distinct. With a pair of smooth, denuded callosities just before the middle, as in *callosa*. Surface similar to that of head. The pubescence on the pronotum is directed irregularly, giving a ragged appearance. Elytra black next to the scutellum and across the base where normally covered by the base of the pronotum. Anterior legs of male not modified. Anterior tibial spurs of both sexes rather stout, spiniform,

somewhat incurved. Posterior tibial spurs slender, the outer sticklike, the inner spiniform.

Holotype: ♂ Luna Co., *New Mexico*, 4000 ft. July 25, 1939, Rehn and Rehn (Acad. Nat. Sci. Phila.)

Allotype: ♀ Douglas, Arizona, July 23, 1929 W. W. Jones (Parker)

Paratypes: 1♂ Dragoon Mts., Arizona IX-10-47 D. J. & J. N. Knull (Ohio State); 1♂ Sierra Blanca, El Paso Co., Texas, Sep. 13-14, 1912 (USNM).

This species runs to *callosa* LeConte in my key but is distinguished by the long, shaggy pubescence of the prothorax and back of the head and heavy anterior tibial spurs. It goes to group BB in the table but does not seem to be very closely related to any known species.

Epicauta afoveata sp. n.

Length: 7 to 9 mm. Black, sparsely clothed with pale cinereous pubescence. Elytra with inconspicuous scutellar and humeral black spot. A member of the *cariceps*

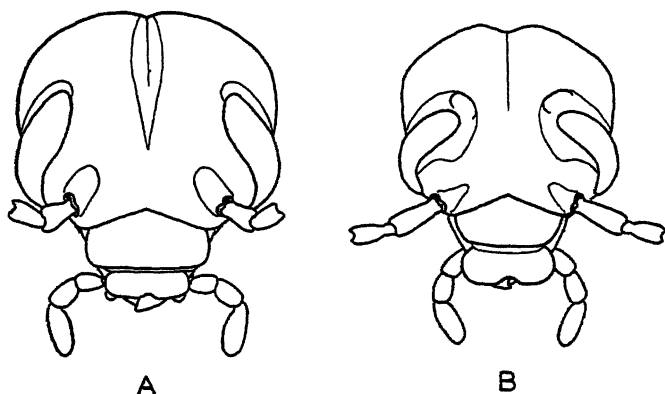


Fig. 2. A. Head of *Epicauta afoveata* sp. n. B. Head of *Epicauta impressifrons* V.D.

group, apparently most closely related to *impressifrons* Van Dyke, which it resembles in general appearances, differing mainly in the lack of occipital callosities, lack of a pit at the inner border of the eyes and by certain secondary sexual characters in the male. (Fig. 2.)

Head subtriangular, without occipital callosities or deeply impressed hind margin. Surface shiny, feebly microreticulate, moderately densely and deeply punctured except near the midline on the occiput, on the antennal calluses and on a narrow zone behind the eyes. Midline distinctly impressed to just below the upper level of the eyes. A narrow zone in the middle of the head often glabrous and without punctures, as in Fig. 2A. Antennal calluses small but denuded. Eyes oblique, narrow, rounded at the inner margin, bordered behind by a narrow, smooth, denuded zone one-fourth their greatest width. There is no trace of a pit at the inner edge of this denuded zone. Clypeus and labrum sculptured like rest of head. Antennæ almost uniform in thickness, reaching the basal third of the elytra, two and one-half times as long as an anterior tibia. First segment reaching one-third across the eye, moderately slender but nevertheless the thickest segment. There is often some cinereous pubescence on the dorsal and posterior surfaces. Second segment two-sevenths as long as first, moderately slender; third slender, a little more than twice as long as second; fourth three-fourths as long as third; the rest decreasing slightly in length and thickness.

Pronotum slightly broader than long, with the sides roughly parallel on the basal two-thirds, then converging at a forty-five degree angle. Surface more deeply punctured and microreticulate than that of head. Disc roughened, flattened on the basal two-thirds, with a feeble narrow median smooth area on the basal half. Basal impressed line deep; median suture absent or present only on the middle of the disc. Pubescence of the disc sparse, directed laterally in part and in a pair of small anterior whorls. Elytra with slightly denser pubescence than the head, with scutellar and humeral black spot, inconspicuous because of the sparseness of the pubescence. Pubescence of the underside denser than above, uniformly pale cinereous. Second to sixth abdominal sternites of male broadly denuded, the sixth strongly notched apically. Legs with pale cinereous pubescence except for the tips of the femora, tips of the tibiæ and outer edge of mid-

dle tibiae and the tarsi, which are black. The first tarsal segments often have a few cinereous hairs dorsally at the base.

Male with two spurs on the anterior tibiae and with posterior surface of trochanter, femur and tibia of middle and hind legs denuded, slightly flattened, with a dorsal fringe of long cinereous hairs. Posterior tibial spurs slender, sticklike.

Holotype: ♂ Borrego, San Diego Co., California Oct. 8, 1947 G. P. Mackenzie (M.C.Z. No. 28220)

Allotype: ♀ eutopotypical (M.C.Z.)

Paratypes: 11♂♂, 3♀♀ eutopotypical; 2♀♀ topotypical Oct. 28, 1939; 1♂, 1♀ topotypical Oct. 14, 1948. 5♂♂, 6♀♀ San Jacinto Mts., Riverside Co., California Oct. 7, 1947. 1♂ Vallecitos, San Diego Co., California Oct. 28, 1939. All collected by G. P. Mackenzie.

Paratypes are deposited in the collections of the U. S.N.M., Chicago Nat. Hist. Mus., Calif. Acad., G. P. Mackenzie and F. Werner.

Mr. Mackenzie, who kindly loaned this fine series for description, appends the following information on the localities: Borrego (sometimes spelled Borego), several miles south of the town; San Jacinto Mts., about fifteen miles west of Indio on Rt. 74, on the east slope of the mountains; Vallecitos, 20 miles south of Borrego. Elevation of all three places ca. 2500 ft. Vegetation of a desert type.

In my key the male runs to couplet 37, differing from *aspera* and *nigritarsis* by being black with sparse cinereous pubescence and in having the midventral abdominal black markings composed of denuded areas with at most scattered, very short pubescence, rather than of black pubescence which is as dense as on the rest of the abdomen in *aspera*. The female keys to couplet 67, but differs from *ingrata* and *longicollis* in its small size and uniform pubescence. Some females of *impressifrons* also key out here but can be distinguished by head form.

Epicauta impressifrons Van Dyke

1929, Bull. Br. Ent. Soc. 24: 12.

Several samples of *Epicauta* from near the type lo-

cality of *impressifrons* are composed of specimens which seem most closely related to that species but which differ in several characters ordinarily of importance in the group. The variation is continuous enough that all should be included in *impressifrons* but isolated samples often have a distinctly different aspect.

First there is a striking difference in size and more or less correlated with it a difference in pubescence, the larger specimens having it much denser. Also more or less correlated with the denser pubescence is the presence of the midventral, lateral and dorsal black abdominal markings and scutellar and humeral spots characteristic of the *caviceps* group to which *impressifrons* belongs.

One lot of eight specimens from Whitewater has midventral spots in both males and females. Another series of 25, from Morongo Valley, collected by G. P. Mackenzie, has these spots in the male but not in the female even though some are as large as the Whitewater females. This series has sparser pubescence than the Whitewater lot. Other smaller lots from several localities are similar to the Morongo Valley set.

The distribution of the species seems to follow a definite northwest-southeast line, from Cajon Pass in San Bernardino Co. to Fish Springs on the Salton Sea. It has been taken most abundantly in the vicinity of Palm Springs in Riverside Co., at Whitewater, Cabazon, Morongo Valley and Indio, all within twenty miles map distance from Palm Springs, in the Coachella Valley.

Epicauta occipitalis sp. n.

Length: 8 to 11 mm. Black, densely clothed with yellow-cinereous to light rufous pubescence, which is darker above than below. Disc of pronotum with dense short, erect pubescence, not denuded anteriorly as in *diversipubescens* Mayd. Elytra usually with a small black scutellar spot. Denuded spots on the midline of the abdominal sternites in the male. Middle and hind femora of male flattened behind, denuded and with a margin of long hairs above. Head bulging at the occiput, the bulge not split by a deepened midline.

Head suboval, widest just behind the eyes, broadly rounded behind, with the posterior margin straight in front view, excavated when seen from above. Seen in side view, the occiput appears bulged. Surface densely punctured except along the narrowly denuded midline. Antennal calluses small, denuded. Median impressed line distinct down to the level of the eyes. Eyes fairly prominent, rather narrow (.47 times as wide as long), transverse. Antennæ reaching to the middle of the elytra in the male, two and two-thirds as long as an anterior tibia, slightly shorter in the female, two and one-half times as long as an anterior tibia, slender, almost uniform in thickness, slightly thicker in the male than in the female. First segment reaching halfway across the eye, the stoutest segment; second .55 times as long as first; third as long as first; fourth and following subequal, three-fourths as long as third. The first three segments have some pale pubescence.

Pronotum broadly campanulate, slightly longer than broad, densely clothed on the disc with short erect pubescence. This pubescence is composed of short, swollen but pointed hairs which are circular in cross-section. *E. wheeleri* Horn has similar discal pubescence, *E. rileyi* and *E. rehni* similar but much more slender. The midline and an oblique area from the anterior angles to the middle somewhat elevated. Elytra with a small scutellar black spot which may be reduced to a few hairs. Abdominal sternites of male with a denuded spot on the midline posteriorly, with only a few short black hairs and setæ present on them. Middle and posterior trochanters, femora and tibiæ of male flattened and broadly denuded behind, fringed above with long pale pubescence. The corresponding edge of the anterior trochanters and femora also denuded but not fringed with long hairs. Anterior tibial spurs of male slightly shortened, the first tarsal segment a little thickened. Posterior tibial spurs slender, sticklike. Tips of femora and tibiæ and all but base of tarsi with black pubescence.

Holotype: ♂ 20 mi. N. of Mesquital, *Lower California*

IX-27-1941 Ross and Bohart (Calif. Acad. No. 6126)

Allotype: ♀ eutopotypical (Calif. Acad.)

Paratypes: 17♂♂, 10♀♀ eutopotypical. 1♂ El Arco, L. Calif. IX-28-1941.

Paratypes have been placed in the M.C.Z. collection (No. 28222), Chicago Nat. Hist. Mus., collections of F. H. Parker, G. P. Mackenzie and F. Werner.

The localities are in the Vizcaino Desert in the southern part of the northern district of Lower California. (See Proc. Calif. Acad. Sci. (4th ser.) 24: 8.)

This species belongs to the *caviceps* group and looks most like *diversipubescens* Mayd. but differs in its narrower head, bulging occiput and thickened erect hairs on the pronotum. The male keys to couplet 37, *aspera* but differs in the broadly denuded flattened surface of the femora. The female keys to part 2 of couplet 64 (with the addition of "or with a small scutellar spot") and thence to *rehni* in couplet 75. It differs from *rehni* in lacking the ridges on the head and from *uniforma* and *alpina* by the dense erect pubescence on the pronotal disc.

Epicauta lauta subsp. *rossi* subsp. nov.

Large series of *Epicauta lauta* from the United States show very little variation in color. One specimen from Lower California, the only representative of the species seen from there, shows a striking deviation from the usual uniform coloration. It has the pubescence the same as in *lauta* but the ground color is black, with the elytra tan. It looks more like the female of *polingi* than *lauta* but is structurally identical with the latter.

Holotype: ♂, 15 mi. S. of San Domingo, Lower California October 4, 1941. Ross and Bohart. (Calif. Acad. No. 6127).

Epicauta virgulata (Lec.)

Macrobasis virgulata LeConte, 1866, Smiths. Misc. Coll. 6: no. 167, 2nd ed.: 156.

Epicauta virgulata, Werner, 1945, Bull. M.C.Z. 45: 512 (in part).

A re-examination of material in this species shows that two species are present, *virgulata* being the Lower California species, extending to southwestern Arizona and *hirsutipubescens* (Mayd.) being found from western Texas to southeastern Arizona.

The description of *virgulata* in my revision need not be greatly changed except for addition of characters by which it differs from *hirsutipubescens*. The shape of the hind trochanters serve to separate it in both sexes (Fig. 3). In the male the first antennal segment reaches

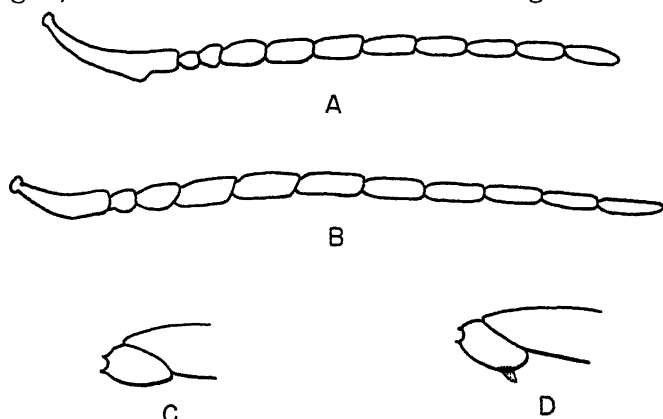


Fig. 3. A. Antenna of *Epicauta virgulata* (Lec.), male. B. Antenna of *Epicauta hirsutipubescens* Mayd., male. C. Metatrochanter of *Epicauta virgulata*, male. D. Metatrochanter of *Epicauta hirsutipubescens*, male.

nearly to the hind margin of the head and is equal to the following four in length. It is deeply excavated externally near the apex. Second segment small, two-thirds as long as third, which is also broader. The second to sixth segments are dorso-ventrally flattened, the ventral surface of the second to fourth smooth and apparently forming a clasping organ, opposing the antennal excavation. Middle femora and trochanters denuded behind, flattened and slightly excavated, margined ventrally with a few long hairs and also dorsally on the trochanters.

Specimens from Lower California have the body col-

or dark brown to black, the legs rufous. The Sinaloa and Arizona specimens have the legs of the same color but the body color paler so that the contrast is not as great. I can find no other differences. There is a slight variation in the width of the antennal segments but it occurs in the Lower California and Arizona specimens alike. The pubescence is composed of hairs which are brown at the base and cinereous apically. The brown zone may be up to two-thirds of the length of the hair or reduced to less than one-third, thus affecting the general color of the insect considerably. Lower California specimens in general have more brown than Arizona specimens.

Localities: Lower California: Comondu; 5 mi. So. of San Miguel, San Domingo; San Quentin; Coyote Cove, Conception Bay; Venancio; Triunfo; 10 mi. S. of Catawina; La Paz; Todos Santos; all in the southern district. Sinaloa: Los Mochis. Arizona: Ehrenburg, Yuma Co.; Cave Creek, Maricopa Co.; Gillespie Dam, Maricopa Co.; Florence, Pinal Co. I am very much indebted to the California Academy for permission to study the Lower California and Sinaloa specimens.

Epicauta hirsutipubescens (Mayd.)

Macrobasis hirsutipubescens Maydell, 1934, Trans. Am. Ent. Soc. 60: 334.

Epicauta virgulata, Werner, 1945, Bull. M.C.Z. 45: 512 (in part).

This species can be distinguished from *virgulata* by the shape of the hind trochanters (Fig. 3) and by the shorter first antennal segment and lack of long hairs on the middle femora of male. In the male the first antennal segment reaches the hind margin of the eye and is equal to or slightly shorter than the following three, and is not as deeply excavated as in *virgulata* (Fig. 3). The second to fifth segments are not flattened and expanded. The posterior trochanters of the male have a tuft of hairs on the posterior border as in the figure.

West Texas specimens are usually black, with grey pubescence (as in the type) or with tan pubescence, in

which the individual hairs are unicolorous. The discal stripe on the elytra is not as prominent as in *virgulata* and southeastern Arizona specimens. Arizona specimens, from the southeastern part of the state, have the ground color brown and the pubescence brown at the base and white at the apex, and with the discal stripe very distinct. There seems to be no morphological difference between the two groups and it must be presumed that the range is continuous in northern Chihuahua. Occasional specimens from Arizona have the pubescence very similar to western Texas specimens. The southeastern Arizona specimens tend to be a little stouter and shorter than the Texas series or southwestern Arizona *virgulata*.

Localities: Texas: Lozier Canyon, Terrell Co.; Tornilla Flat, Big Bend Nat. Pk.; Marathon; Culbertson Co.; Ft. Stockton; McNary, Hudspeth Co. New Mexico: Organ, Dona Ana Co.; Hope, Eddy Co.; Hot Springs, Sierra Co. Arizona: Benson; Huachuca Mts.; Sta. Rita Mts; Globe; Badger; Tubac; San Carlos; Tucson; Patagonia; Nogales; Calabasas Canyon, Tumacacori Mts; Arivaca, Pima Co.

A NEW LEPTOTHORAX COMMONLY INHABITING
THE CANYON LIVE OAK OF CALIFORNIA
(HYMENOPTERA: FORMICIDÆ)

BY MARION R. SMITH

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In the late nineteen thirties Arnold Mallis of the University of California sent me, for determination, a new species of *Leptothorax* which he and Jack Schwartz had collected at Devil's Gate Dam, Pasadena, California. Later the same ant was received for determination from Mrs. Wilda S. Ross of Santa Barbara, California, who had been given specimens of it by C. H. Muller. Dr. Muller's specimens were found nesting in an oak gall in the Figueroa Mountains of Santa Barbara County, California. Although recorded from a small number of California localities only, it is probable that the new ant has a much wider distribution, occurring wherever the canyon live oak is found or perhaps even beyond. Because of the commonness of this new species on canyon live oaks and its association with galls on these trees from near San Francisco to Los Angeles County, it seems desirable to describe the form.

Leptothorax (*Leptothorax*) *gallæ*, new species

Worker.—Length 3 mm.

Head measured through its greatest breadth and length, one and one-seventh times as long as broad, with approximately straight posterior border, rounded posterior corners and weakly convex, somewhat subparallel sides. Eye rather large, located at approximately the middle of the side of the head. Antenna 12-segmented; apex of scape failing by more than its greatest diameter to attain the posterior border of the head; funiculus with a 3-segmented club, which is scarcely longer than the re-

mainder of the funiculus, last segment of the club longer than the combined length of the two preceding segments. Frontal area present but not strongly defined. Middle of the anterior border of the clypeus with a distinct but weak impression or emargination. Mandible 5-toothed. Thorax slender, highest in the vicinity of the junction of the promesonotum, sloping both anteriorly and posteriorly from this region; from above, widest in the pronotum and narrowest at the base of the epinotal spines, with rounded humeri and obsolescent or missing dorsal thoracic sutures, also lacking the mesoepinotal impression. Epinotal spines fairly robust, not strongly divergent, longer than the distance between their bases. Femora and tibiae, especially the former, noticeably incrassated. Peduncle of petiole with a small but distinct anteroventral tooth. Petiolar node, in profile, angular, the anterior slope almost straight, the posterior slope shorter and more irregular than the anterior. Postpetiolar node, from above, about one and one-fourth times broader than long, with rounded humeri and subparallel sides, somewhat constricted in the posterior half. Gaster with distinct angles.

Mandibles striate, also punctate. Clypeus with about 7 to 9 prominent carinae, one of them median and the other lateral. Head densely and minutely punctate with the front bearing delicate longitudinal rugulae. Cheeks rugulose or rugulosepunctate. Thoracic dorsum rugulosepunctate, the rugulae most evident on the promesonotum; meso and metapleuræ longitudinally rugulose punctate. Petiolar and postpetiolar nodes more minutely rugulosepunctate than the thorax.

Head, thorax, petiole and postpetiole subopaque; frontal area and gaster shining. In some lights the head is almost shining.

Body with moderately abundant, coarse, suberect to erect, pale yellowish or grayish hairs; those on the gaster more abundant than elsewhere. Antennæ and legs hairless, bearing only appressed pubescence.

Brown; posterior part of gaster and much of head blackish.

Type locality.—Devil's Gate Dam, Pasadena, California.

Described from a holotype and 15 paratype workers collected by Arnold Mallis and Jack Schwartz at the type locality indicated above. Six of the specimens including the holotype are labeled 2-20-38, no. 1 and the remainder 2-26-38, no. 2. No information on their biology is available. The holotype and some of the paratype workers are in the United States National Museum collection under U. S. N. M. No. 59152.

The paratypes differ from the holotype especially in size, color and the degree of sculpturing. The largest paratype is 3.4 mm., the smallest 2.8 mm. Some specimens have the body a more uniform brown than others; in most specimens, however, the head is darker than the remainder of the body. The sculpturing on the head and thorax varies considerably with regard to coarseness and abundance but in general is of a similar nature.

Leptothorax gallæ appears to be related to *nevadensis rudis* Wheeler from which it especially differs in its more slender thorax, with more rounded humeri and less flattened dorsum; petiolar node, in profile, more sharply angular; postpetiolar node, from above, longer in proportion to its breadth; head darker, and usually with less satiny luster or shine. So far as I am aware, *gallæ* nests in trees, especially in galls that occur on trees, whereas *nevadensis rudis* has only been reported nesting in the soil beneath stones. Further collecting however, may prove that neither species is confined to the habitat indicated by observations thus far recorded.

Other localities in California where this ant has been collected:

Arroyo Seco in Pasadena; 2-6-37; Arnold Mallis and Jack Schwartz. Camp Baldy in Los Angeles County; 9-6-18; L. H. Weld; on *Quercus chrysolepis* Liebm., the canyon live oak; Hopkins U. S. No. 15611 b. Mill Valley, Marin County; Mch. 1947, Wilda S. Ross.

Los Gatos in Santa Clara County; different dates during 1918 and 1919; R. D. Hartman; on *Quercus chrysolepis* Liebm., the canyon live oak; Hopkins U. S. No. 15922 e, h.

Figueroa Mt., Santa Barbara County; 11-4-45; C. H. Muller; from an oak gall.

From these data it can be seen that the new ant is commonly found on the canyon live oak, *Quercus chrysolepis* Liebm., which is distributed along the California Coast Range and the western slopes of the Sierra Nevada. This oak however, is not confined to California, but occurs in southwestern Oregon, northern Mexico and Baja California, southwestern Utah and New Mexico, southeastern Nevada, and much of Arizona. At Los Gatos the species has been collected from twig galls made on the canyon live oak by cynipid wasps belonging to the following species: *Heteroecus pacificus* (Ashm.), *H. sanctæ-clarae* (Fullaway) and *Disholcaspis truckeensis* (Ashm.).

TRITOMA DISSIMULATOR CROTCH.—There seems to be no record of this species from either Maine or Mass. and it is listed as from "Ill.," which is the locality given by the describer. I took it at Paris, Me., June 15, 1910, and July 12, 1914, and in June, 1945. My records from Mass. are: Framingham, Oct. 10, 1915, under bark; Sherborn, June 8, 1913; Hopkinton, June 7, 1925; Berlin, July 5, 1936, in fungus. Other records in my collection are: Mt. Washington, N. H., June 24, 1913; Mont-real Id., Quebec, taken by G. Chagnon; Edmonton and Leduc, Alta., F. S. Carr; Victoria Beach, Man., June 17, 1923, C. S. Brooks. There are single records in both the New York and the New Jersey lists.—C. A. Frost, Framingham, Mass.

A NEW *GRUIMENOPON* (MALLOPHAGA—
MENOPONIDAE)¹

BY R. L. EDWARDS

Biological Laboratories, Harvard University

The genus *Gruimenopon*, typically parasitic on the bird family Gruidæ (cranes), has not been previously recorded from North America.

Gruimenopon canadensum, n. sp.

Plate 6

A relatively atypical member of the genus. 14 males averaged 1.94 mm. in length and 12 females averaged 2.29 mm. in length. Uncleared specimens superficially resemble species of the genus *Colpocephalum*, being light tan in color with large, dark ocular and cervical sclerotizations. Sexual dimorphism, excluding size, very slight.

Head broader than long, not as smoothly rounded anteriorly as in *G. longum*. Antennæ with terminal segment typically elongate-cylindrical (Fig. 4). Latero-posterior margin of temple with three very long, stout setæ. Thorax as in *longum*. Prothoracic tibia with fairly well developed comb. Meso- and metathoracic tibiæ with relatively thick patches of setæ distally. These patches consist of three or more almost comb-like rows of fine and coarse setæ. Metathoracic femora and fourth abdominal sternite with large brushes typical of genus. Terminal segments with very long, stout setæ directed posteriorly.

Female with only shallow, median indentation in eighth sternite.

Male genitalia characterized by large, hyaline, terminally squared prolongation of basal plate. Parameres hyaline, only slightly curved, each with single seta terminally. Preputial sac beset with numerous, small teeth. Other sclerotized structures connected with basal plate and preputial sac best indicated by figure 3.

¹ Published with a grant from the Museum of Comparative Zoology at Harvard College.

Type host: *Grus c. canadensis* (Linn.), the little brown crane.

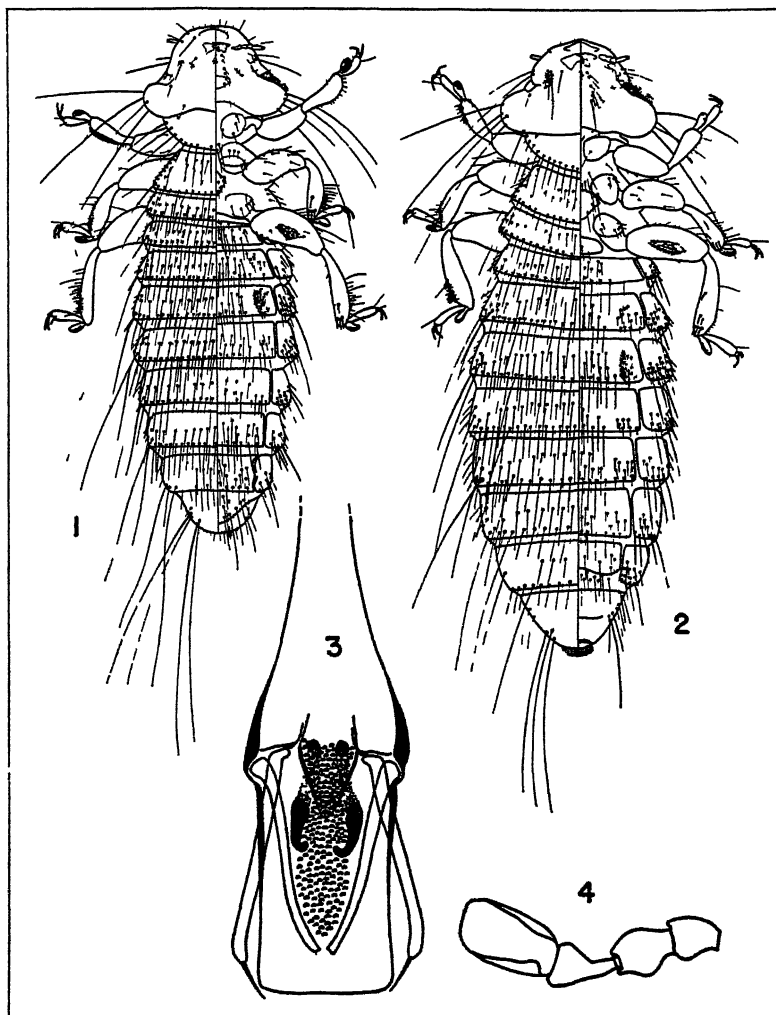
Type Material: Holotype male, allotype female, 13 paratype males and 12 paratype females. Material collected from skins in the Museum of Comparative Zoology as follows; skin #63187, collected by F. B. Armstrong, Refugio Co., Texas, December 11, 1912; and skin #252139, collected by F. S. Hersey, St. Micheal, Alaska, June 3, 1915. Holotype and allotype deposited in the Museum of Comparative Zoology. Paratypes will be distributed to United States National Museum, American Museum of Natural History, and British Museum of Natural History.

Discussion: This enigmatic species seems to be intermediate between *Gruimenopon* and *Heleonomus*. The ocular and cervical sclerotizations, the general head shape and the male genitalia all seem to be more closely allied to *Heleonomus*. In other features, such as shape and chætotaxy of thorax and abdomen, it is like members of the genus *Gruimenopon*, in which genus it is retained because these features seem more significant generically.

EXPLANATION OF PLATE 6

All figures refer to *Gruimenopon canadensum*, n. sp.

- Fig. 1. Male, dorsal-ventral view.
- Fig. 2. Female, dorsal-ventral view.
- Fig. 3. Male genitalia.
- Fig. 4. Male antenna.



NEW AMERICAN SYRPHID FLIES OF THE SUBFAMILY ERISTALINÆ

BY FRANK M. HULL

University of Mississippi

A number of species of Syrphid flies from the Neotropical region have been studied by the author during the past year. This paper describes the members of the subfamily Eristalinæ. The types are in the author's collection.

Eristalis vera n. sp.

A large species related to *scutellaris* but distinguished by entirely black pile in front of the transverse mesonotal suture and by the polished black hind tibiæ. Length 13 mm.

Female. *Head*: face, front and cheeks shining black, the sides of the face with wide, thin, greyish white pollinose bands which reach to the epistoma. Facial pile white; frontal pile, vertical pile black. The greyish white pollen of the face proceeds narrowly up along the frontal eye margin for two-thirds the length of the front. The upper portion of the front has an opaque black band extending from margin to margin which is acutely produced forward in the middle of the front for a short distance. The anterior margin of the black spot tends to be bordered by white pollen. The lower part of the front above the preantennal callus is slightly raised and minutely punctate. The callus has diagonal, rugose furrows on either side. The antennæ are black; the arista is reddish sepia becoming a little lighter towards the base. Eyes bare. Facial concavity moderately deep above the tubercle. *Thorax*: mesonotum and scutellum entirely black pilose; only the notopleura and the ventral scutellar fringe are whitish pilose. There is an indistinct grey band in front of the transverse suture. The anterior margin of the transverse suture itself is obscurely margined with greyish white pollen. Behind the transverse

suture there is a broad band of opaque black followed by a wider band of shining bluish black. In front of the scutellum there is a medially rounded, transverse band of opaque black extending forward at the postcalli to include all of these structures. The pile of the postcalli is entirely black. The scutellum is clear, opaque yellow with the declivitous portion of the base and narrow lateral basal triangles black. The pleural pile is white but black on the pteropleura. Squamæ white on the outer lateral basal corners, the remainder black or dark brown with blackish border and fringe. *Legs*: black, the basal third of the anterior and middle tibiæ dark sepia brown but only when viewed anteriorly or posteriorly. Hind femora and tibiæ polished black, the former considerably thickened, especially in the middle, the latter with a low, short, apical, angular production. *Tarsi* black. *Wings*: not quite hyaline basally; they are heavily but diffusely tinged with dark brown beginning just before the end of the second basal cell and the beginning of the submarginal cell. The deep brown color extends a little beyond the anterior cross vein and includes the stigmal area. Remaining apical half of wing pale brownish grey, partly due to the thick villi. *Abdomen*: shining black; very faintly bluish. There is a large, medial, posterior, hollow-sided triangle on the apex of the second segment which in the middle extends broadly to the base of the segment but quite narrowly to the posterior corners. Third segment with a posterior, biconvex, medially notched, opaque band. Fourth segment similar, the band less convex and the medial notch minute. Fifth segment with a small, oval basal black spot on either side, the remainder shining. Abdomen elongate and characteristic of the species of the *scutellaris* group.

Holotype: Female, Nova Teutonia, Brazil, Fritz Plau-mann. Jan. to April, 1948.

Eristalis cora n. sp.

A dull obscure species with opaque rusty brown scutellum. Distantly related to *obsoleta* Bigot. Length 10 mm.

Female. *Head*: Face and front black, largely shining, the former with a very large, rounded, shining tubercle leaving the face deeply concave above. Upper portion of the face and narrowly along the sides of the eye margin above the tubercle, together with a diagonal stripe from the lower eye margin to the epistoma all greyish white pubescent. Pile of face long and yellowish white. Lower frontal pile yellowish with some black hairs intermixed, the pile becoming entirely black on the upper part of the front and vertex. There is a narrow, complete band of pale brownish yellow to yellowish white pollen across the front before the anterior ocellus and a similar narrow band across the middle of the front. The intervening area is opaque black but the transverse margins of these pollinose bands are irregular. The front has a crescentic, transverse crease just above the low short callus. The antennæ are very dark sepia becoming blackish on the dorsal half of the quite large third antennal segment. Third segment dark reddish below. Arista dark red and bare. Eyes with sparse, pale brown pile. *Thorax*: mesonotum dull in color and largely obscure yellowish grey pollinose. There is a diffuse, obscure, blackish spot in front of the suture on either side of the mesonotum. There is a larger, subtriangular, similarly opaque black spot widely bordering the posterior margin of the suture; this spot is widely separated from the spot upon the other side of the mesonotum and each extends posteriorly for a short distance towards the corners of the scutellum. This opaque black spot is rounded posteriorly but tends to fade out and become indistinct. From the posterior view the transverse suture is conspicuously bordered by a linear, pale, yellow, pollinose stripe. Scutellum opaque reddish brown or rusty brown. Pile of mesonotum yellowish anteriorly becoming distinctly brownish red on the posterior half of the mesonotum. Scutellar pile abundant, rather long and yellow, postcallar pile entirely reddish. Pleural pile entirely yellow to reddish yellow. *Legs*: the femora are shining black with the narrow apex of the anterior and middle pairs brown. The hind femora are considerably thick-

ened in the middle and become obscurely reddish upon the outer fourth, but more clearly reddish towards the apex. The anterior tibiae are quite black except narrowly at the base where it is reddish brown to yellowish brown in color. The middle tibiae are yellowish brown becoming more reddish in color beyond the middle. The hind tibiae are somewhat flattened, slightly arcuate and entirely deep reddish brown; the apex is without spur, the anterior tarsi are blackish with the first and second segments narrowly brown at the apex. The middle and hind tarsi are light brownish red to yellowish brown except upon the last segment which is dark brown. *Wings*: tinged with pale brownish yellow throughout, the costal and subcostal and narrow posterior margin somewhat paler. There is a very strong stigmal cross vein present. *Abdomen*: black and almost entirely shining with strong brassy reflections especially upon the second, third and fourth segments. The first segment is opaque grey and there is in the middle of the base of the second segment a rather large, opaque black, diffusely margined triangle which is bordered laterally by a wide, diagonal stripe of opaque grey pollen fading out before reaching the apex of the segment. Posterior margins of third, fourth and fifth segments with quite narrow, laterally attenuate, linear, opaque black margins followed by even wider, opaque, pale yellow margins; the pale yellow margin on the fourth segment is especially wide and conspicuous. Fifth segment shining black and somewhat brassy but this reflection is less pronounced than upon previous segments.

Holotype: Female, Nova Teutonia, Brazil, Fritz Plau-mann. Jan. to April, 1948.

Eristalis claripennis n. sp.

A small species with opaque rusty brown scutellum, the eyes of the male narrowly separated and densely blackish pilose above. Related distantly to *obsoleta* Bigot. Length 8 mm.

Male. *Head*: face and front black, largely shining, the sides of the face widely greyish yellow pubescent

with long, sparse, yellowish pile. The front is obscurely brownish yellow pollinose above; the eyes are separated by not quite twice the width of the anterior ocellus. Vertex opaque black, the pile of front and vertex long and black. The upper ocular pile is long, abundant and very dark brown to almost black; the lower pile is more sparse and yellowish in color. The antennæ are black, the third segment a little more elongate and perhaps from one and one-third to one and one-half times as long as wide. Arista dark reddish. The facial tubercle is well developed but most abrupt below leaving the face gently concave above. *Thorax*: mesonotum dull opaque black with faint traces of a pair of brownish grey, submedial vittæ anteriorly; the transverse suture is conspicuously bordered anteriorly by a linear band of yellowish white pollen. Behind the transverse suture the mesonotum is somewhat more obscurely opaque black fading away into very dark greyish black pollen. The mesonotal pile is yellowish on the anterior half becoming chiefly blackish posteriorly; the postcallar pile is almost entirely black with two or three yellow hairs. Scutellum opaque orange or rusty brown, the lateral corners narrowly blackish. The scutellar pile is long, erect and yellow except for a group of black hairs in each basal corner. Squamæ dark brown. *Legs*: the femora are blackish becoming obscurely yellowish brown near the apex; the apex of the hind femora is subapically reddish. The hind femora are considerably thickened, the point of greatest thickness lies just beyond the middle. The anterior tibiæ are blackish except the very narrow base which is yellowish brown. Middle tibiæ light yellowish brown throughout. Hind tibiæ slightly flattened with very little pile, the apex transverse, the base and apex light brownish red, the middle diffusely blackish but divided, except upon the narrow dorsal margin, by a conspicuous, light yellow triangle. Anterior tarsi blackish. The middle and hind tarsi upon the first three segments are brownish yellow but the medial margin of the hind basitarsi is dark brown; remaining segments of these tarsi dark brown. *Wings*: quite hyaline with a strong stigmal cross vein. *Abdo-*

men: black and largely shining, the first segment is chiefly opaque grey, the second is opaque black on the anterior and posterior margins and these fascia are joined in the middle. Third segment with a moderately large, opaque, black triangle resting on the base of the segment in the middle and connected to a wide, black, posterior fascia which occupies fully one half the length of the segment. Fourth segment with a minute, basal, medial triangle narrowly connected to the wide, black, posterior fascia. Hypopygium entirely shining. Posterior margins of second, third and fourth segments quite narrowly brownish yellow.

Holotype: male, Nova Teutonia, collected by Fritz Plaumann. Jan. to April, 1948.

Mallota intermedia n. sp.

An aberrant species covered with light reddish brown pile upon the thorax and abdomen. Abdomen shining black, slightly metallic. Mesonotum brownish orange pollinose with obscure darker vittæ. Length 12 mm.

Female. *Head*: the face, cheeks and front are shining black, the face has a band of sparse, greyish white pile rather narrowly encircling the low tubercle and then proceeding upward to the antennæ. There is a narrow, wedge-shaped triangle of similar pubescence proceeding from the eye margin opposite the antennæ towards the base of the antennæ. The lower eye margins are also bordered narrowly with similar pollen, which does not extend upward upon the front. However, most of the frontal eye margins are narrowly bordered with brownish yellow pollen and the upper third of the front is broadly dark brown pollinose; the lower part of the front is shining black and the vertex is shining black. The pile of the face is long, rather abundant and white. The frontal pile is long and black and white intermixed with a few yellow hairs along the eye margins and in front of the ocelli. The occipital pile is yellowish above with a few black hairs anteriorly along the eye margin. The occipital pile becomes almost white ventrally. The first

and second antennal segments are black, the third very dark brown with reddish base. The arista is slender, bare and yellowish brown with white apex. The third antennal segment is short oval. The eyes are rather thickly covered with shining yellowish white pile. *Thorax*: the mesonotum and humeri are black, feebly shining, heavily obscured with an orange brown pollen. There is a pair of submedial, rather wide, definite but indistinct, blackish vittæ which run about three-fourths the length of the mesonotum; there is also a large spot anterior to the transverse suture and another wedge-shaped spot posterior to the transverse suture. These spots and vittæ are also overlaid with brown pollen and they are only visible at certain angles. The scutellum is translucent, brownish orange with light brownish orange pile. The mesonotal pile is similar in color but seems to have less reddish tint and there are numerous fine black hairs interspersed upon the posterior half of the mesonotum. Pleura black, thinly yellowish pubescent on the posterior border of the mesopleura, the sternopleura and the anterior half of the hypopleura and all of the metapleura. Pleural pile orange above, nearly white below. Squamæ yellowish brown, the halteres yellow with brown stalk. *Legs*: black, the tarsal segments narrowly reddish brown in the middle of the apex. The hind femora are only moderately thickened, are long yellow pilose medially and dorsally with a few reddish hairs along the middle of the lateral surface and with black pile or bristles ventrally on the apical half. The hind tibiæ are arcuate and flattened; they are black pilose on the apical half, medially, ventrally and dorsally but yellow pilose throughout the entire length laterally. The pile of the anterior femora and tibiæ is almost entirely black but is narrowly yellow along the anterior margin of each and posteriorly along the basal half of the femora. The middle tarsi are chiefly reddish brown with diffuse, central blackish areas on these tarsi dorsally. *Wings*: distinctly tinged with yellowish or reddish brown over the middle of the wing, more dilutely in the costal cell

and throughout the entire marginal cell, subcostal cell and all of the submarginal cell. The stigmal cross vein is distinct and well formed. The marginal cell is widely open. *Abdomen*: black with a distinct metallic appearance ranging from brassy for the most part to patches of bluish or coppery color. The pile of the first segment is pale yellow; on the remainder of the abdomen the pile is long and thick and light reddish brown, and the ground color is not obscured. Along the lateral margins of the third and fourth segments the pile is pale yellow but along the lateral margin of the second segment and more widely towards the base there are numerous long black hairs and a few long black hairs on the lateral margin of the fifth segment. Sternites shining black with very long pale yellow hair.

Holotype: female, F. Sinchono District, Huanuco, Peru, Aug. 20, 1947, Jose Schunke.

Meromacrus matilda n. sp.

A dull black species with reduced quantity of yellow tomentum. Related to *brunneus* Hull, it is a smaller species and the anterior diagonal band of tomentum upon the thorax ends at the inner end of the humeri and the sutural band of similar tomentum extends the length of the suture. Length 10–11 mm.

Female. *Head*: face and cheeks black, the former with a wide band of pale yellowish white or grey pubescence which extends across beneath the antennæ. The pile of the face is pale yellow and extends together with the pubescence narrowly up the sides of the front. The front is black, shining on the lower half with extensive brown pollen across the upper half. The vertex is black, its pile and that of the front black except along the eye margins where the frontal pile is yellow. The antennæ are black; the third brown becoming paler apically, and is somewhat thickened. The eyes are bare, the occiput conspicuously covered with pale, creamy yellow tomentum extending to the vertex. *Thorax*: the mesonotum is black; there is a not very conspicuous, moderately wide band of pale yellow tomentum placed diagonally forward

to the anterior margin of the mesonotum. The transverse suture is bordered by a complete band of similar tomentum from its medial end to the edge of the mesopleura. There is a similar band, rather narrow just before the scutellum including the posterior border of the postcalli. This band is not wider in the middle. On the anterior half of the mesonotum there is a rather wide but not conspicuous, grey, medial, pollinose vittæ. It is bordered on either side by a faint but wider blackish stripe with faint, brown pollen and outside of these submedial vittæ there are large, triangular areas of a faint but still lighter pollen. The remaining lateral area of the mesonotum, the notopleura excluded, are dull, dead black. The pleura are black with pale yellowish grey pollen on the posterior border of the mesopleura. The pile of the pleura is yellowish white and not very long. Scutellum black becoming obscurely dark brown on the posterior third of the middle only. The scutellar pile is black and rather sparse. Squamæ subtranslucent greyish brown with narrow black border and brownish yellow fringe. Halteres orange. *Legs*: black with the ventral apical half of the hind femora very dark reddish brown; this reddish color includes the whole of the extreme apex of the hind femora. The hind tibiæ are very dark reddish brown throughout and while the anterior and middle tarsi are nearly or quite black, the hind tarsi are very dark brown. *Wings*: the entire anterior margin of the wings including the costal, subcostal cells and the stigmal areas are rather uniformly reddish brown. This color includes all of the submarginal cell, except the loop, and it extends into the upper basal corners of the first posterior cell, into nearly all of the first basal cell above the vena spuria, except the outer lower corners, and it includes the posterior basal half of the first basal cell and more dilutely the basal half of the second basal cell. *Abdomen*: entirely black with a thin, inconspicuous band of sparse, appressed, yellow tomentum in the middle of the posterior border of the first segment. The pile of the second segment is entirely black setate and appressed except upon the lateral margin and the an-

terior corners. Third segment appressed, black pilose except the lateral margins and except for an inconspicuous row of appressed yellow hairs on the extreme base of the margin. These yellow hairs are not tomentose. Fourth segment chiefly black pilose but an oblique view shows scattered, appressed, yellow hairs among the black ones. Fifth segment with sparse yellow hairs. The yellow pile upon the lateral margins of all of the segments is comparatively short and inconspicuous.

Holotype: female, Pucallpa, Peru, Nov. 8, 1947, Jose Schunke.

Meromacrus villosa n. sp.

A trim, black and yellow species, rather similar to *anna* Curran. Length 12 mm.

Male. *Head*: face and cheeks black, the cheeks with a broad band of pale yellow pubescence in which however there is a peculiar dark spot best viewed from the side. This pollen also extends beneath the antennæ. The pile of the face is pale yellow together with the pollen extending upon the sides of the front. Middle of front dully shining black with linear, medial depression; the frontal pile is entirely yellow except for one or two black hairs. The antennæ are entirely black; second segment longer than the first, the third elongate oval, gently arched dorsomedially but not truncate. The arista is but little thickened, is brownish basally, becoming pale at the immediate tip. The vertex is shining black with pale pollen in front of the ocelli, short black pile between the ocelli and yellow pile behind. The occiput has pale yellow tomentum which extends up to the vertex. The eyes are bare and narrowly touching. *Thorax*: mesonotum dull deep black with a fine, narrow, greyish white line of pollen medially which runs only a short distance beyond the transverse suture. There is a band of rather wide, thick, well developed, pale, creamy yellow tomentum running inside the humeri directly across the notopleura almost to the wing base and anteriorly it runs diagonally forward towards but not to the midline where it ends in a sharp medial point. The posterior margin

of this band is straight. There is a minute, narrow patch of similarly colored tomentum on the medial half of the transverse suture separated from the diagonal band by a distance equal to its own length. In an oblique light the anterior diagonal yellow band is bordered by a wide, extensive, jet black, opaque stripe which occupies the full width between this diagonal band and the slender, medial sutural band. There is a similar band of creamy yellow tomentum just in front of the suture covering the posterior ends of the postcalli and expanded medially but gradually until it is about twice as thick as laterally. The scutellum is deep black with short, dense, black pile and a few longer pale hairs. The extreme posterior margin of the scutellum is yellowish brown but this can scarcely be seen from above. Pleura black, the posterior margin of the mesopleura and all of the remaining pleura except the posteroventral half of the hypopleura thinly yellowish white pollinose. There is a vertical middle band of only moderately long but thick white pile on the pleura. Squamæ smoky brown in color with nearly white fringe and dark brown border. Halteres orange. *Legs*: all of the femora are black to the apex except the hind femora. On the hind femora the ventral apical third, half way up the sides, and at the extreme apex, is yellowish brown; this color diffusely merges into the black of the remainder. The anterior and middle tibiæ and their tarsi are entirely black. The hind tibiæ are black except upon the basal ventral half. The hind tarsi are black. Coxæ and the lower and basal portions of the hind femora with long, thick, crinkly pile, pale yellow except in the middle of the femora where it is brownish. The ventral apical third of the hind femora also is thickly beset with short, fine, black bristles. Pile of the hind tibiæ and their tarsi pale yellow except that in the middle of the hind tibiæ ventrally the yellow is mixed with considerable long, dark brown pile. *Wings*: mostly hyaline. The subcostal cell proximal to the stigmal cross vein, the basal half of the marginal cell and all of the submarginal cell, except the loop, are pale smoky brown in color. The anterior margin of the second longitudinal vein is nar-

rowly brownish. The greater part of the outer half of the marginal cell and all of the stigmal portion of the costal cell, except the apex, and all of the costal cell, are hyaline as is the remainder of the wing. There is some suggestion of two tones in the colored portion of the wing as the posterior margin of the second longitudinal vein seems to be slightly more yellowish and the area behind more blackish. *Abdomen*: dull black with prominent bands of pale creamy yellow tomentum as follows: the posterior margin of the first segment except the sides, the entire anterior margin of the third segment and fourth segment. The pile of the second segment is entirely dense, short, black setate except that the lateral margins are narrowly fringed with conspicuous, pale, brassy yellow pile. The third segment is entirely brassy yellow pilose although in some lights it appears to be blackish. The margin of this segment is likewise tinged with yellow pile. Fourth segment with longer and therefore more conspicuous brassy pile, subappressed throughout the segment except for the basal tomentum. Hypopygium thickly pale yellow pollinose with long, scattered, golden pile.

Holotype: male, Pucallpa, Peru, Dec. 8, 1947, Jose Schunke.

Meromacrus flavolinea n. sp.

A large black species in which the femora and coxæ are long pilose. Related to *brunneus* Hull. Length 14 mm.

Male. *Head*: face and cheeks shining black, the face with a broad stripe of pale yellow pubescence running from eye margin to the epistoma and continued beneath the antennæ and more narrowly up the sides of the front. The greater part of the front is shining black, becoming deep reddish black immediately in front of the antennæ. The pile of the face is pale yellow and that of the front of the same color with four or five black hairs intermixed. The vertex is black with black pile except in front of the anterior ocellus. The eyes are bare, touching for a short distance; the occiput is black with yellow tomentum ex-

tending up to the vertical triangle. The first and second segments of the antennæ are black; the third is black except at the extreme base which is slightly reddish; second segment longer than the first; the third segment is distinctly, obliquely truncate dorsoapically, with a single basal pore laterally and another medially. The arista is brownish yellow basally, paler distally and somewhat thickened, except that the apex is quite fine. *Thorax*: mesonotum dull black with a distinct, medial, yellowish grey pollinose vitta which becomes more narrow and is almost evanescent as it reaches the scutellum. There is a diagonal band of yellow tomentum on the inner border of the humeri which does not extend to the lateral margin and which becomes wider medially. It is not clearly bordered by opaque black except in an oblique light. The transverse suture is bordered with yellow tomentum rather widely and evenly from its medial end past the notopleura to the extreme lateral margin and there is a prescutellar band uniform in width of thickness equal to the one upon the transverse suture. The scutellum is black basally becoming diffusely brown posteriorly, the pile abundant and of varying length and black except for a few pale hairs on the margin. The pleura are black with the whole sternopleura, the anterior half of the hypopleura and the posterior border of the mesopleura densely pale yellow pubescent or pollinose and with a thick, vertical, middle band of long, fine, pale yellow pile with crinkled ends. This long yellow pile is situated on the posterior part of the mesopleura, the pteropleura and the upper sternopleura. Squamæ brown with dark sepia brown border and fringe. Halteres orange yellow. *Legs*: the femora are black, the hind pair greatly thickened and becoming diffusely reddish brown upon the outer third. The entire ventral surfaces of these femora are also reddish. The anterior tibiæ are dark reddish brown becoming black anteriorly and their tarsi are nearly black. The middle tibiæ are entirely reddish brown, their tarsi dark reddish brown and the hind tibiæ and tarsi also entirely brownish red. The pile of the hind tibiæ is golden in color, the dorsal

pile of their tarsi black. The coxæ and femora are long, thickly bushy pilose; the pile is pale golden yellow but the hind femora ventrally and apically have a tuft of fine, long, black hair. *Wings*: anterior border of the wings dark brown, extending almost to the apex of the first posterior cell leaving the loop of this cell entirely clear. The costal cell and the basal portion of the stigmal area and also the subcostal cell are more yellowish. *Abdomen*: black, the first segment with a posterior band of yellow tomentum; the second is entirely black pilose upon the posterior half with golden yellow pile anteriorly and laterally. The third segment has a prominent, narrow, basal margin of yellow tomentum, the remainder of its pile short setate and black, except medially on the posterior margin where it becomes reddish. Fourth segment with a similar band of yellow, basal tomentum, the remainder of its pile entirely golden red. Pile of the hypopygium yellow, the entire hypopygium greyish yellow pollinose.

Holotype: male and one paratype male, Pucallpa, Peru, Dec. 11, 1947 and Feb. 5, 1948, Jose Schunke.

Quichuana nigra n. sp.

A rather large black species which is related to *bezzi* Ceresa. It clearly lacks brown color below the spurious vein. From *parisii* Ceresa it differs in the quite black tibiae. Length about 12 mm.

Female. *Head*: the face is brownish black, the sides entirely pubescent without bare sublateral stripes. The tubercle and a short stripe above which reaches only to the bottom of the concavity are shining and bare. The facial pile is abundant and long and yellow. The front and upper part of the face are quite protuberant. The front is shining black with an obscure reddish line down the middle of the lower part; the frontal pile is abundant and except for two or three black hairs it is entirely brassy yellow but this pile nowhere obscures the ground color. Viewed from above there is an acute triangle of coarse yellow micropubescence on the upper part of the front a little way below the ocelli. This triangle is con-

fluent with the narrow and similarly pubescent eye margins. The pile on the anterior part of the raised ocellarium is black; upon the posterior portion it is yellow. The occipital pile is brassy yellow with some slender black hairs above lying anterior to the yellow ones. The ocular pile is slightly flattened, moderately abundant and brilliantly shining silvery with perhaps a faint yellowish cast. The first segment of the antenna is black, the second almost black; both are black pilose. The third segment is comparatively short compared to other species of this genus; it is distinctly wider basally and viewed from the outside this segment is about one and one-third times as long as its greatest width. The third segment is narrowly reddish basally but otherwise black: it has a large, medial, basal, ventral pore. The arista is light brownish yellow throughout; the apex quite fine. *Thorax*: mesonotum shining black with a pair of dull, rather well separated, brownish grey pollinose vittæ situated in the middle of the mesonotum which are distinct for only a short distance beyond the transverse suture. The humeri are a deep reddish brown with a large, rounded patch of dense, pale yellow pubescence upon the medial portion. This patch does not extend to the posterior part of the humeri. Between this patch of pubescence and the medial grey stripes there is an opaque black spot which fades out diffusely behind and which has a very short, diffuse, posterior extension bordering the grey vittæ and an equally obscure diffuse extension partially encircling the humeri. The scutellum and postcalli are very dark reddish brown and shining with short, erect yellow pile on each. The mesonotal pile is quite short and golden or brassy yellow but over the wing there is a wide dense patch of black setæ. The notopleura and a small spot behind the suture are covered with a dense tuft of curly yellow long pile. Pleura black with long curly yellow pile on the mesopleura and thick yellow pile and pubescence on the pteropleura, sternopleura and hypopleura. Squamæ nearly white with dark brown border and fringe. Halteres orange on both knob and stalk. *Legs*: the femora are black, the apices of the anterior

femora are yellowish brown, but those of the middle femora are darker and the hind pair are entirely black except at the acute basal union with the trochanters and a small yellow ventral apical spot. The pile of the femora is yellow with sharp black setæ ventrally upon the outer third of the hind pair. The hind femur is distinctly more enlarged and thickened than in most species of *Quichuana*. The anterior tibiae are reddish brown, obscurely darker near the apex anteriorly and posteriorly. The middle tibiae are similar. The hind tibiae are unusually arcuate, quite flattened and nearly black from a lateral view; they are a little more reddish medially, their ventral margin black pilose, their medial pile yellow except apically where it becomes black or dark reddish brown. The anterior and middle tarsi are brownish black on the second, third and fourth segments, lighter on the remainder. All of the hind tarsi are quite black with black pile. *Wings*: with distinctly two shades of color in addition to the hyaline portion. The costal and first basal cell behind the spurious vein and the whole of the second basal cell are distinctly pale brownish yellow. The subcostal cell, marginal, all of the submarginal cell, except the loop, all of the first basal cell above the spurious vein and the antero-basal corners of the first posterior cell, are rather deep sepia brown. *Abdomen*: The first segment black and nearly opaque with only a few, posteriorly directed, fine, yellow hairs and an oval, medial patch of yellow pollen in the middle. There is yellow, laterally directed, matted hair only upon the sides and not entirely throughout the posterior half of the segment. The second segment is shining black with a distinct, rather large, nearly equilateral, rounded triangle of opaque black lying on the middle of the base of the segment and extending half the length of the segment. The pile of this segment is widely yellow upon the sides extending from the posterior corners diagonally but narrowly to the base of the segment in the midline, the remainder of the pile is black and also nearly erect. Third segment shining black with a narrow, basal band of brassy yellow pile of nearly uniform width but expanding close to the lateral margins to include the

whole lateral margin. Fourth segment similarly colored and pilose, the yellow pile expanding gradually immediately from the middle of the segment and running diagonally to the postero-lateral corner. The pile of all three of these segments, second, third and fourth, is thick and abundant but short. Pile of fifth segment scarcely longer, black down the middle narrowly and upon the posterior margin but widely yellow upon the remainder.

Holotype: female, Pucallpa, Peru, Feb. 5th, 1947; Jose Schunke.

Quichuana ursula n. sp.

This is a black species which traces to *picadoi* Knab from which it is immediately distinguished by the black hind tibiae and the dark brown anterior ones. Length 8 mm.

Male. *Head*: face yellowish white pubescent with brassy yellow pile and an indistinct, nearly bare sublateral stripe in addition to the shining medial stripe over the face. The front is shining black with a distinct tubercular swelling at the upper part of the front and a very slight, rounded elevation subapically below over which there is a medial crease. The frontal pile is quite long and sparse and chiefly black with a few yellow hairs along the sides and a thin line of yellow pubescence along the eye margins. The front and the upper part of the face are but slightly projecting and the facial concavity very low. The occiput is black with black pile in front and black and yellow pile behind; the yellow pile is more abundant. Extending throughout upon the occiput there is an anterior fringe of black hairs which is quite long upon the upper third of the occiput. The minute triangle in front of the ocelli is yellow pubescent. The antennae are comparatively short; the third segment is at least one and a half times as long as wide when viewed laterally, perhaps a little longer; its basal margin is reddish and the remainder black; the arista is light brownish red with fine apex; the first two segments are black with black pile. The eyes have moderately thick bright shining yellowish white pile. *Thorax*: mesonotum dully shining black with

a pair of brownish grey, well separated, submedial vittæ extending a short distance behind the transverse suture. The scutellum is almost black and might easily be mistaken for black. There is an elongate oval, posteriorly acute spot of dense, pale yellow pubescence inside of the black humeri and between this spot and the submedial vittæ there is a quite obscure, opaque black area which is not easily seen except from the rear; this opaque area extends obscurely for a short distance posteriorward and also sends an equally obscure band laterally behind the humeri. This pattern is quite distinct. The pile of the mesonotum is brassy yellow, abundant, longer than in *nigra*, still longer before the scutellum and longer upon the scutellum. There is a distinct, thick, wide patch of black setæ above the base of the wing and there is a patch of long, crinkled yellow tomentum upon the notopleura immediately behind it and down the posterior margin of the mesopleura. The sternopleura and pteropleura are yellow pilose and together with the hypopleura are thickly, densely pale yellow pubescent. The squamæ are pale brownish white with the posterior third blackish; their border is black with a pale yellow fringe. Halteres orange. *Legs*: femora quite black, the anterior and middle pair obscurely brown at the apex, the hind pair with a small yellowish spot ventrally near the apex. The hind pair are moderately thickened with yellow pile but short, stout black setæ ventrally upon the apical third. The anterior and middle tibiæ are very dark reddish brown throughout; the hind tibiæ are only slightly arcuate, moderately flattened and quite black, their ventral, dorsal and lateral pile black; their medial pile is pale yellow, becoming brownish red at the apex. The anterior tarsi are uniformly dark reddish brown and this is true of the middle tarsi which are perhaps only a very little paler on the first segment. The hind tarsi are very dark brownish black with black pile above and dark reddish brown pile below. *Wings*: The costal cell is perhaps faintly yellow throughout. The whole of the subcostal cell, the marginal cell and all of the submarginal cell except the loop are dark brown; the brown color extends on either side of the anterior cross vein to fill the upper basal angle of the first

posterior cell and the upper outer angle of the first basal cell and also connects with the central node of the spurious vein just below the base of the marginal cell, the remainder of these cells as well as the remainder of the wing hyaline. *Abdomen*: first segment black with sparse yellow pile throughout upon the posterior border which is tufted and matted but not conspicuously; it has a few hairs directed posteriorly in the middle. The second segment is dully shining black with a large, diffuse margined, opaque black, basal triangle which extends from close to the antero-basal corners to nearly two-thirds the length of the segment. The basal pile of the second segment is rather long, erect and yellow even on the basal triangles but near the middle of the segment it becomes black and the whole posterior margin of the segment is rather long, fine, erect black pilose except that there is none upon the lateral margins. The third segment has similar pile only a little shorter across the base of the segment which extends more or less diagonally down to include the posterior corners; the remainder of the pile is black, erect and scarcely shorter. On the fourth segment the pile is erect and yellow but sparse on the basal half; it becomes entirely black and suberect upon a large posterior triangular area of the segment which also excludes the lateral margins. Hypopygium quite shining and quite black with long fine yellow pile.

Holotype: male, Pucallpa, Peru; Dec. 4, 1947; Jose Schunke.

I would consider this to be the male of *nigra* because of its black color and similarly obscure thoracic pattern if there were not so many differences. The front is less protuberant, the antennæ slightly longer, the frontal pile predominantly black. There are semi-bare sublateral facial stripes and the hind femora of the male is slightly but distinctly less thick than in *nigra* which is a female; the hind tibiæ are much less arcuate, the squamæ have wide blackish borders, the scutellum is more blackish, the pile of the mesonotum and scutellum much longer and there are some differences upon the pattern of brown upon the wing besides still other differences.

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NEW SPECIES OF MECOPTERA FROM NORTHWEST CHINA¹

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The Mecoptera or scorpion flies described in the present paper were mostly collected by Prof. Io Chou, Mr. Tien Ho Hei and the writer in Sikang Province during the course of an insect pest survey for the scientific expedition of the Sino-British Committee in 1939. Other specimens were sent to me by Prof. Io Chou, Mr. Chuan Lung Lee and Mr. Chia Chu Tao, to whom I am deeply indebted. In this paper, seventeen new species are described, including one previously identified by Dr. Tjeder as *cornigera*.

In describing the new species, I have followed the terminology of R. E. Snodgrass in his "Principles of Insect Morphology" (1935) and F. M. Carpenter in his "Revision of the Nearctic Mecoptera" (Bull. Mus. Comp. Zool. 1931, 72: 205-277), viz., coxopodites ("basistyles"), harpagones ("dististyles"), hypandrium ("lower appendage"), hypovalvæ (branch of hypandrium), preëpiproct ("upper appendage or epiandrium"), parameres ("ventral valves or titillators") and ædeagus ("dorsal valves") for the males, and subgenital plate and internal skeleton for the females.

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FAMILY PANORPIDÆ

Genus *Panorpa* Linn.

This genus is represented in China (not including Formosa) by 17 species, which may be grouped into three categories on the structure of the 6th abdominal segment of the male, as shown by Carpenter. In the first or *centralis* group, with a single anal horn, we have *centralis* Tjeder and *flavipennis* Carpenter; in the second or *dicerus* group, with the double anal horn, we have *dicerus* McLachlan, *tjederi* Carpenter, *stotzneri* Esben-Petersen and *kimminsi* Carpenter; in the third or *davidi* group, without the anal horn, we have a great number of species, i.e., *davidi* Navas, *stigmatis* Navas, *cladocerca* Navas, *tetrazonia* Navas, *waongkehzeni* Navas, *tincta* Navas, *japonica* Thunberg, *curva* Carpenter and *difficilis* Carpenter. Two other species, *guttata* Navas and *bonis* Cheng are known only from the female, so that the position of these two species in the above grouping has yet to be determined.

Panorpa emarginata n. sp.

Figures 1, 11, 12, 24, 26, 29

Vertex entirely black; rostrum grayish brown anteriorly, yellowish brown laterally; thorax yellowish brown laterally, pronotum blackish brown, meso- and metanotum entirely pitchy black; the 1st to 6th abdominal segments pitchy black dorsally and ventrally, last few abdominal segments yellowish brown; 6th abdominal segment of male with a single anal horn, yellowish brown in color. Fore wing: length, 14 mm.; width, 3.5 mm.; membrane hyaline, without markings except for a slight suspicion of gray at the apex; pterostigma prominent, indi-

cated by light brown color; the distal hind margin of wings slightly emarginated. Hind wing: length, 12.5 mm.; width, 3.5 mm.; similar to fore wings. ♂ genitalia: genital bulb less rounded; coxopodites long, broadened towards its apex; harpagones short, the outer margin very slightly concave at the middle the inner margin with a median small triangular tooth and a large basal concave area; hypandrium inconspicuous; hypovalvæ long, with slightly concave median outer margins, extending nearly to the base of the harpagones; parameres simple and long, usually reaching to the distal part of harpagones, each consisting of a single stalk, which broadens at the middle, and each very long and sharp distally, bearing a series of long barbs at its distal inner margin; preëpi-proct narrow towards the apex, with nearly straight sides and a narrow U-shaped distal incision; ædeagus with very long apical processes and well prolonged lateral processes, the distal inner margin of the former usually jointed with a broad triangular plate. ♀ genitalia: subgenital plate elongated, emarginated posteriorly, the incision being very small; internal skeleton large, the plate concave at its median sides with a pair of sharp distal posterior arms and two pairs of small basal side plates, the axis straight, extending beyond the plate nearly one-fourth its length.

Holotype (♂): Mt. Hwa, Shensi; June, 1942; Io Chou; in the Museum of Comparative Zoology. *Allotype* (♀): Same collecting data as holotype; in my own collection. *Paratypes*: 3 ♂, 4 ♀, same collecting data as holotype; in National Northwest College of Agriculture, Wukung, Shensi.

This species, possessing a single anal horn, belongs to the *centralis*-group, with the wing membrane transparent as in *centralis* Tjeder. The wing apex of *centralis* Tjeder is colorless, whereas that of *emarginata* is maculated with a slight suspicion of gray. The male genitalia differ from those of *centralis* Tjeder by the less rounded genital bulb and the longer and sharper parameres.

Panorpa obtusa n. sp.

Figures 2, 25, 27, 30

Vertex entirely black; rostrum reddish brown, with weakly defined grayish stripe on each side; thorax reddish brown laterally, entirely black dorsally; the 1st to 6th abdominal segments black dorsally and ventrally, last few abdominal segments of male reddish brown, the hind border of the third tergite of male prolonged into a small semicircular process, 6th abdominal segment furnished with a single anal horn, reddish brown in color. Fore wing: length, 14 mm.; width, 3.55 mm.; membrane light grayish brown, without markings except for a slight suspicion of grayish brown at the apex; pterostigma prominent, indicated by grayish brown color; the wing apex obtuse, broader than in the preceding species. Hind wing: length, 13 mm.; width, 3.5 mm.; similar to fore wing. ♂ genitalia: genital bulb rounded, coxopodites long; harpagones short and stout, the outer margin smoothly curved, the inner margin with a greatly reduced median tooth which cannot be seen from ventral view and a large basal concave area; hypandrium inconspicuous; hypovalvæ rather straight, reaching nearly to the base of the harpagones; parameres simple and stout, usually not extending beyond the tips of coxopodites, each consisting of a single spindle-shaped stalk, formed by the outer strongly sclerotized part; the distal inner margins of parameres furnished with a series of long barbs; preëpiproct slightly narrow towards the apex, with a wide U-shaped distal incision; ædeagus with small lateral processes and a pair of long apical processes, the inner margins of the latter nearly parallel to each other.

♀ unknown.

Holotype (♂): Mt. Taipai, Shensi; July 14, 1943; Chuan Lung Lee; in my own collection.

This species belongs to the *centralis* group, having the same wing marking as the preceding species, but the body color and the structure of male genitalia, especially the short parameres, make its recognition easy.

***Panorpa typicoides* n. sp.**

Figures 3, 13, 14, 28, 31

Body mostly black; vertex black anteriorly, brown posteriorly; rostrum entirely brown; thorax black dorsally, yellowish brown laterally, meso- and meta-notum as a rule with a broad brown median band; 1st to 6th abdominal segments of male black dorsally and ventrally, last few abdominal segments reddish brown, anal horn absent; the hind border of third tergite slightly prolonged behind, and in contact with the small, sharp conical production on the median axis of the fourth tergite; abdominal segments of female entirely black. Fore wing: length, 12.5 mm.; width, 3 mm.; membrane hyaline, markings sooty brown; pterostigmal band complete, with a broad basal branch and a separated narrow apical branch; basal band interrupted, represented by two large spots; apical band broad, with a large hyaline spot posteriorly; basal spot very small; marginal spot large, not extending beyond the vein R₁; pterostigma brown, very prominent. Hind wing: length, 11.5 mm.; width, 3.3 mm.; similar to fore wings, except that the basal spot and the anterior part of the basal band are entirely lacking. ♂ genitalia: genital bulb rounded; coxopodites long, U-shaped, furnished with a series of long hairs at the distal inner portions; harpagones slender, the outer margin slightly concave at the middle, the inner margin with a median angle and a small basal concave area; hypandrium inconspicuous; hypovalvæ rather long, reaching to the base of the harpagones; parameres simple and slender, each consisting of a single stalk, which is distinctly twisted and pointed at its apex; præpiproct slender, slightly narrow towards apex, with a deep U-shaped distal incision; ædeagus with finger-shaped apical processes and slightly prolonged lateral processes, the distal inner margins of the former usually produced inwards to form a small nipple-shaped plate. ♀ genitalia: subgenital plate elongated, broadened at the middle; internal skeleton long, the plate narrow towards its base with a pair of sharp posterior arms, the axis very

long, extending nearly two-thirds its length beyond the plate.

Holotype (♂): Tachienlu, 5000–8500 ft., Sikang; Aug. 27, 1939; F. Y. Cheng, Io Chou and Tein Ho Hei; in the Museum of Comparative Zoology. *Allotype* (♀): Same collecting data as holotype, in my own collection. *Paratype*: 1 ♂, same collecting data as holotype, in my own collection.

This species, belonging to the *davidi* group, is a very interesting one, superficially resembling the common European species *communis*; but the peculiar shape of the genital segments both in male and female makes it easily recognized as a distinct species.

Panorpa fructa n. sp.

Figures 5, 6, 7,

Body mostly sooty black, last few abdominal segments of male reddish brown, vertex black anteriorly, deeply reddish brown posteriorly; rostrum uniformly reddish brown. Fore wing: length, 11.5 mm.; width, 3 mm.; membrane hyaline, markings light brown, ill-defined, fragmentary: pterostigmal band incomplete, with a spot-like basal branch; basal band represented by two spots; apical band appears as a light suspicion of brown at the apex; basal spot very small; marginal spots large; pterostigma not very prominent. Hind wing: length, unknown; width, 3 mm.; similar to fore wing, except that basal band and basal spot are entirely absent. ♂ genitalia: genital bulb very rounded; coxopodites long, stout, with four spine-like hairs and a series of short hairs in its distal inner portions; harpagones slender, the outer margin rather straight, the inner margin with a median angle and a rather large basal concave area; hypandrium inconspicuous; hypovalvæ shorter than in the preceding species, far from reaching to the base of the harpagones; parameres simple, long and twisted, the distal half well-developed, with rounded apex furnished with a short spine-like tip; preëpiproct rather short, broad at the base, narrow towards apex, with a broad U-shaped distal incision;

ædeagus with long apical processes and long lateral processes, the former with rather straight inner margins and double sinuous outer margins.

♀ unknown.

Holotype (♂): Wakiakeng, 50 miles west of Tachienlu, Sikang; Sept. 9, 1939; F. Y. Cheng, Io Chou and Tein Ho Hei; in my own collection.

This species belongs to the *dauidi* group, and resembles that species superficially, but differs in the broader genital bulb and especially in the well-developed distal part of the parameres and in the shape of the ædeagus.

***Panorpa sexspinosa* n. sp.**

Figures 4, 8, 9, 15, 16

Vertex yellowish brown, with four dark spots on its anterior region, one small spot enclosing the median ocelli anteriorly, one around the other two ocelli posteriorly, the other two are on both sides of the former two spots; rostrum uniformly yellowish brown; thorax blackish brown dorsally, light yellow laterally, meso- and meta-notum as a rule with broad median light yellowish streaks; abdominal segments dark brown dorsally, light brown ventrally, hind part of 6th abdominal segment of male and its last few abdominal segments yellowish brown, the hind border of the third tergite with a band-like prolongation. Fore wing: length, 12 mm.; width, 3 mm.; membrane hyaline, markings darkish brown; pterostigmal band complete, with a broad basal branch and a narrow apical branch; basal band unusually broad; apical band complete, with a hyaline spot; basal spot very small; pterostigma not very prominent. Hind wing: length, 10.8 mm.; width, 3 mm.; similar to fore wing, except that the small basal spot is lacking. ♂ genitalia: genital bulb rounded; coxopodites long, with six spines on its distal inner margins; harpagones slender, the outer margin smoothly curved, the inner margin with a reduced median angle and a large basal concave area; hypandrium inconspicuous; hypovalvæ rather short, not nearly reaching to the base of the harpagones; parameres narrow and

slender, each consisting of a single stalk which is somewhat twisted and pointed at its tip; preëpiproct slender, the distal incision being almost quadrate; apical processes of ædeagus somewhat prolonged on its distal outer margins. lateral processes well-developed. ♀ genitalia: subgenital plate elongated, slightly emarginate posteriorly; internal skeleton large, the plate distinctly concave at its base, with a pair of sharp posterior arms and a pair of anterior side plates; axis well-developed, extending beyond the plate for nearly one-third its length.

Holotype (♂): Mt. Taipai, Shensi, June, 1942; Io Chou; in my own collection. *Allotype* (♀): Same collecting data as holotype; in the Museum of Comparative Zoology. *Paratype*: 1 ♀, same collecting data as holotype; in my own collection.

This species, belonging to the *davidi* group, differs from the others in its wing markings; the basal band is as broad as in *cladocerca* Navas, but its pterostigmal band is quite different. The structure of male genitalia, especially the six spines on the distal coxopodites, makes its recognition easy.

Panorpa semifasciata n. sp.

Figures 19, 20, 21, 53

Body entirely sooty black; vertex black; rostrum uniformly black; the middle part of 8th abdominal tergite slightly prolonged into a band-like prolongation, the 9th abdominal tergite very broad, its lateral borders bent ventrad to embrace the posterior part of subgenital plate in ventral view. Fore wing: length, 14 mm.; width, 3.5 mm.; membrane light yellow, markings sooty brown; pterostigmal band incomplete, with an interrupted narrow basal branch; apical band small, with two hyaline spots; pterostigma prominent. Hind wing: length, 12.8 mm.; width, 3 mm.; similar to fore wing, except that the basal branch of pterostigmal band is greatly reduced. ♀ genitalia: subgenital plate broad, with strongly sclerotized median part and less sclerotized lateral borders, apex of subgenital plate rounded, less sclerotized, fur-

nished with several long hairs; internal skeleton flattened, the plate very small, less sclerotized, the posterior arms of the internal skeleton very long, sharp and strongly sclerotized, axis flattened, jointed with posterior arms and extending a little beyond the plate.

♂ unknown.

Holotype (♀): Jihti, 30 miles east of Tachienlu, Sikang: Sept. 1, 1939; F. Y. Cheng, Io Chou and Tein Ho Hei; in my own collection.

This species differs from all the formerly described species by its body color, reduced wing markings and the peculiar shape of the genital segment of female. The position of this species in the above grouping is not determined.

Panorpa leei n. sp.

Figures 17, 18, 54

Vertex black; rostrum reddish brown, with a short and deep brown stripe on each side of its upper portion; thorax black dorsally, yellowish brown laterally; 1st to 6th abdominal segments black dorsally and ventrally, the 7th to 9th abdominal segments very small, reddish brown. Fore wing: length, 14 mm.; width, 4 mm.; membrane hyaline, markings sooty brown; pterostigmal band broad, with a complete basal branch, and a greatly reduced spot-shaped apical branch; apical band small, including a prominent narrow band and some faintly smoky spots: pterostigma prominent. Hind wing: length, 13 mm.; width, 3.55 mm.; similar to fore wing, except that the basal branch of pterostigmal band is greatly reduced. ♀ genitalia: subgenital plate small, narrowed posteriorly, apex rounded; internal skeleton long, the plate abruptly narrow at the base, with a pair of sharp posterior arms, the axis extending for nearly half its length beyond the plate.

♂ unknown.

Holotype (♀): Mt. Taipai, Shensi; July 14, 1943; Chuan Lung Lee; in the Museum of Comparative Zoology. *Para-*

type: 1 ♀ same collecting data as holotype; in my own collection.

The material was collected by Chuan Lung Lee, in honour of whom I name the species.

This species differs from all the formerly described species by its wing markings and the peculiar shape of the genital segment of the female. The position of this species in the above grouping is not determined.

Panorpa statura n. sp.

Figures 32, 33, 34, 57

Vertex dark brown anteriorly, with a black mark within the ocelli, light brown posteriorly, with a median and a pair of longitudinal bands; rostrum uniformly reddish brown; thorax entirely brown laterally, prothorax dark brown dorsally, meso- and meta-notum uniformly blackish brown; the 1st to 4th abdominal segments of the female blackish brown dorsally; brown ventrally, last few abdominal segments entirely brown. Fore wing: length, 16.5 mm.; width, 4.55 mm.; membrane yellowish brown, markings deep brown; pterostigmal band complete, with a broad basal branch and a broad apical branch; basal band interrupted; apical band large with a hyaline spot; marginal spot very small; pterostigma not very prominent. Hind wing: length, 15 mm.; width, 4.2 mm.; similar to fore wing, except that the small marginal spot is lacking. ♀ genitalia: subgenital plate elongated, narrowed posteriorly, shallowly emarginated at its apex, its lateral borders bent laterad to form a narrow lateral portion; internal skeleton long, the plate concave on its median sides with a pair of short tooth-like posterior arms, the axis long, extending beyond the plate for exactly half its length.

♂ unknown.

Holotype (♀): Mt. Taipai, Shensi; July 14, 1943; Chuan Lung Lee, in my own collection.

This species, having a yellowish brown wing membrane, differs from *flavipennis* Carpenter by its very long wing and the markings of the apical band. The peculiar shape

of the genital segment of the female enables its easy recognition. The position of this species in the above grouping is not determined.

Panorpa pusilla n. sp.

Figures 37, 38, 52

Vertex yellow anteriorly with a black spot enclosing ocelli, sooty brown posteriorly with a median quadrangular plate; rostrum uniformly yellow; thorax brownish yellow dorsally, yellow laterally, meso- and meta-notum with sooty brown markings on each side; abdominal segments sooty brown dorsally, yellow laterally and ventrally. Fore wing: length, 1.8 mm.; width, 0.28 mm.; membrane yellow, markings sooty brown; pterostigmal band complete, with a complete basal branch and a separated apical branch; basal band complete; apical band represented by two prominent bands, the inner one narrow, being parallel to the pterostigmal band, the outer one including the wing apex; basal spot situated on the hind margin of wing; marginal spot very large; pterostigma not very prominent. Hind wing: length, 0.95 mm.; width, 0.28 mm.; similar to fore wing, except that the basal spot on the hind margin of wing is entirely lacking. ♀ genitalia: subgenital plate elliptical, with a slightly distal emargination; the plate of internal skeleton small, the posterior arms of the plate large, twisted at the middle, the axis short and slender, not extending beyond the plate.

♂ unknown.

Holotype (♀): Mt. Taipai, Shensi, June, 1942; Io Chou; in the Museum of Comparative Zoology. *Paratype*: 1 ♀, same collecting data as holotype; in my own collection.

This species, having yellowish wing membrane differs, from the other described species by its very small body size, wing markings and the peculiar shape of the genital segment of the female. The position of this species in the above grouping is not determined.

Panorpa bonis n. sp.

Panorpa cornigera Tjeder (nec McLachlan) Ark. Zool., Bd. 27A, no. 33, p. 7 (1935).

The female of this species, which has been well described and figured by Tjeder, resembles *cornigera*, but I am convinced that it is a distinct species. This is also the opinion of Dr. Issiki, who has collected many individuals of the true *cornigera* in Korea and East Siberia. I am, therefore, describing here as new the species identified as *cornigera* by Tjeder.

The "additional side plates" of 7th-8th abdominal segments of this species are not so slender as those of *cornigera*. The subgenital plate is pointed at its posterior part, and shallowly emarginate at its apex, while that of *cornigera* is rounded and not emarginate. The internal skeleton of this species is quite distinct from that of *cornigera*: the plate of the former is slender with a small proximal part and short blunt posterior arms; while that of the latter is broad, with a well-developed oval proximal part and long pointed posterior arms. The axis of this species extending beyond the plate is less than half the length of the whole axis, while that of *cornigera* usually extends beyond the plate more than half its length.

♂ unknown.

Holotype (♀): Lupasze, at River Tao Ho, South Kansu, about 2750 m.; July 11, 1930; Dr. D. Hummel; in the Stockholm Museum.

The position of this species in the above grouping is not determined.

Genus *Neopanorpa* Weele

This genus has heretofore been represented in China (not including Formosa) by ten species, of which *apicata*, *caveleriei*, *dimidiata*, *lacunaris*, *pielina* and *brisi* were described by Navas; and *claripennis*, *nigritis*, *chelata* and *banksi* by Carpenter.

In this paper six species are described as new, of which *validipennis* and *taoi* have undeveloped parameres,

and *choui* bears a large internal skeleton with a well-developed axis.

Neopanorpa choui n. sp.

Figures 22, 23, 43, 44, 45, 62

Body light brown, the middle part of the thoracic notum sooty brown; vertex entirely black; rostrum yellowish brown; median process of third abdominal tergite of male extraordinarily long (measuring up to 4.2 mm.) apparently divided into two portions and bearing a series of dense, short stiff hairs on its ventral surface; the fourth tergite extremely long, almost covering the following abdominal segments, somewhat elevated, and furnished with many short stiff hairs on its surface. Fore wing: length, 3.5 mm.; width, 3 mm.; membrane light yellowish brown, markings light brown, very indistinct; pterostigmal band incomplete, usually represented only by the faint basal branch and apical branch; basal band represented only by two small spots on the hind margin; apical band large; pterostigma brown, very prominent. Hind wing: length, 12 mm.; width, 3 mm.; similar to fore wing, except that the pterostigmal band and the basal are entirely lacking. ♂ genitalia: genital bulb slender; coxopodite long, with truncated apex; harpagones slender, the outer margin concave at the middle, inner margin with a triangular angle and a large basal lobe; hypandrium short and broad; hypovalvæ broad and less sclerotized, with an abruptly narrow apex, extending beyond the base of the harpagones; parameres modified into a pair of sclerotized rods, greatly swollen distally and with an incised apex and fused with the basal part of ædeagus basally; præpiproct narrow distally with truncated and slightly concave apex. Ædeagus rather small, the two apical processes united together; lateral process extending upward with tooth-like apex. ♀ genitalia: subgenital plate broad basally, narrow towards apex and with a narrow U-shaped incision distally; internal skeleton large, the plate little sclerotized, very small, its posterior arms

narrow and slender, sword-shaped, the axis very stout with abruptly curved hook-shaped basal ends.

Holotype (♂): Mt. Chowkung, Yaan, Sikang; July 14, 1939; F. Y. Cheng, Io Chou and Tein Ho Hei; in my own collection. *Allotype* (♀): Same collecting data as holotype; in my own collection. *Paratypes*: 1 ♀, same collecting data as holotype; in the Museum of Comparative Zoology; 2 ♀, same collecting data as holotype; in my own collection.

I take the liberty of naming this species in honour of Prof. Io Chou, of the National Northwest College of Agriculture, who was so kind to me during our expedition.

This species differs from other described *Neopanorpa* by its very long median process of the third abdominal segment and the peculiar structures of both male and female genitalia.

Neopanorpa heii n. sp.

Figures 35, 36, 49, 50, 51

Vertex entirely black; rostrum uniformly brown; thorax sooty brown dorsally, deep brown laterally; the 1st to 5th abdominal segments of male sooty brown dorsally, deep brown laterally and ventrally, 6th abdominal segment twice the length of 5th segment, sooty brown in color, last three abdominal segments also very long, deep brown in color; median process of the third tergite short, never extending to the middle of the fourth tergite, and in contact with the conical projection on the median axis of the fourth tergite; abdominal segments of female sooty brown dorsally, deep brown laterally and ventrally. Fore wing: length, ♂ 12.8 mm.; ♀ 13.5 mm.; width, ♂ 3.2 mm.; ♀ 3 mm.; membrane slightly brown, markings sooty brown; pterostigmal band complete, with a broad basal branch and a greatly reduced and separated apical branch; basal band represented by a reduced marking on the hind margin; apical band well-developed; basal spot very small; marginal spot consisting of two reduced spots; pterostigma prominent. Hind wing: length, ♂ 11.5 mm.; ♀ 12.2 mm.; width, ♂ 3.2 mm.; ♀ 3 mm.; simi-

lar to fore wing, except that apical branch of pterostigmal band, basal band, basal spot and marginal spot are entirely lacking. ♂ genitalia: genital bulb slender; coxopodites rather long, with a projecting apex; harpagones very slender, the outer margin slightly concave at the middle, inner margin with a smooth angle and a true basal lobe; hypandrium rather long; hypovalvæ not flattened, broadened towards the apex, the basal portion wide apart, the median inner parts greatly prolonged upward and overlapping each other; parameres apparently absent; preëpiproct slightly narrow towards the apex, the distal portion bent laterad and caudad so as to embrace the proctiger; ædeagus very small, both the apical and the lateral processes tooth-like, the basal part usually covered by a pair of elliptical membranous plates. ♀ genitalia: subgenital plate broad, with a wide U-shaped distal incision; internal skeleton small, the plate being band-shaped, transversely elongated, the posterior arms of the internal skeleton lanceolate, extending laterad and reaching to the side margins of the subgenital plate, the axis small, fork-shaped, the distal portions of the forks jointed with the basal posterior arms closely.

Holotype (♂): Mt. Chowkung, Yaan, Sikang; July 29, 1939, F. Y. Cheng, Io Chou and Tein Ho Hei; in my own collection. *Allotype* (♀): Same collecting data as holotype, in my own collection.

I take the liberty of naming this species in honour of Mr. Tein Ho Hei, who was so kind to me during our expedition.

This species superficially resembles *caveleriei* Navas in wing markings, but it can be distinguished by the greatly reduced apical branch of the pterostigmal band in the fore wing and the entire lack of this band in the hind wing. Another difference is the unforked R2a of this species as compared with the forked R2a in the re-described figure of *caveleriei* Navas by Esben-Petersen (1921, p. 83). However, the specific characteristics cannot be determined for certain until the structure of the 9th abdominal segment has been studied. This species

also resembles *chelata* Carp. in wing markings but these two species are at once distinguished by the forms of both male and female genitalia.

Neopanorpa validipennis n. sp.

Figures 46, 47, 48, 64, 65

Vertex entirely black; rostrum deep brown, with a median longitudinal light brown streak; thorax sooty brown dorsally, brown laterally, the 1st to 5th abdominal segments of male dark brown dorsally, reddish brown ventrally, 6th segment long, sooty brown, 7th segment reddish brown, 8th segment reddish brown anteriorly, sooty brown posteriorly, both the 7th and 8th segments broaden towards apex, the posterior end of the pleural regions of 7th segment protruding posteriorly to form two small processes, median process of the third tergite rather long, extending nearly to the hind border of the fourth tergite, pointed at the apex when seen dorsally. Under this median process, there is another reddish small process, and on both sides of this median process is a pair of small tooth-like prolongations, the median axis of the fourth tergite slightly protruding upward. Fore wing: length, 14.5 mm.; width, 3.5 mm.; membrane grayish brown, no markings present; veins very stout, R2a usually forked into R2a1 and R2a2; pterostigma not very prominent. Hind wing: length, 13.5 mm.; width, 3.5 mm.; similar to fore wing. ♂ genitalia: genital bulb slender; coxopodites very long, abruptly narrow distally, bearing a number of long hairs on the distal inner margins; harpagones short and slender, the outer margin slightly concave at the middle, furnished with a series of short barbs at the basal half, inner margin with a large lobe basally; hypandrium long, slightly narrow towards apex; hypovalvæ with slender basal stalks, wide apart basally, overlapping each other, the outer borders extending laterad and concave near its middle; parameres club-shaped with rounded apex; preëpiproct slender with rounded apex, the distal outer portion extended laterad to embrace the proctiger, and forming distal tooth-like

processes; ædeagus very small, the two apical processes nearly united, lateral processes extended posteriorly, sharp and tooth-like.

♀ unknown.

Holotype (♂): Jihti, 30 miles east of Tachienlu, Sikkang; Sept. 2, 1939; F. Y. Cheng, Io Chou and Tein Ho Hei; in my own collection.

This species resembles *claripennis* Carp. and *nigritis* Carp. in lacking color markings of wings, but the form of the male genitalia makes its recognition easy.

Neopanorpa taoi n. sp.

Figures 10, 58, 66, 68

Body light brown; vertex entirely black; rostrum light brown with sooty brown stripe on each side; pronotum sooty brown, meso- and meta-notum sooty brown on the median portion; the 1st to 5th abdominal segments of male sooty brown dorsally, last few abdominal segments brown in color, median process of third abdominal tergite short with swollen and truncated apex, not extending beyond the middle of the fourth tergite. Under this process, there is a small median process and a pair of lateral processes; the fourth tergite is provided with a concave area on its anterior portion. Fore wing: length, 0.7 mm.; width, 3.8 mm.; membrane light gray, no markings present, R2a usually forked into R2a1 and R2a2; pterostigma prominent. Hind wing: length, 15.8 mm.; width, 3.8 mm.; similar to fore wing. ♂ genitalia: genital bulb slender; coxopodites long, narrow distally, bearing many long hairs; harpagones rather short, the outer margin convex basally, furnished with a series of short barbs at the middle, inner margin with a large basal lobe with two tooth-like processes, hypandrium broad, hypovalvæ wide apart basally, slightly overlapping each other distally, the basal outer margins greatly convex and strongly sclerotized, parameres simple, lanceolate; preëpiproct slender, with median concaved margins, the distal outer portions extended laterad, forming large, distal, tooth-like processes; ædeagus rather small, both apical proc-

esses and lateral processes tooth-like, extending the same direction and having nearly the same size.

♀ unknown.

Holotype (♂): Mt. Lo, Sichang; June 10, 1944, Chia Chu Tao; in my own collection.

The species is named in honour of Chia Chu Tao. It differs from the preceding one by the broadened apex of the median process of the 3rd abdominal segment and also by the structure of the male genitalia.

Neopanorpa latipennis n. sp.

Figures 39, 40, 55

Body deep brown, black above, vertex black anteriorly, brown posteriorly, with a sooty brown marking on the median portion; rostrum brown, with a sooty brown median stripe on its lower portion. Fore wing: length, 14 mm.; width, 3.53 mm.; membrane hyaline, markings sooty brown; pterostigmal band very broad, with broad basal branch and narrow apical branch, basal band not very prominent, extending to the median portion of the fore wing, apical band very large, represented by a big marking and an inner small Y-shaped band; marginal spots small; pterostigma prominent; the wing apex rather broad. Hind wing: length, 12.55 mm.; width, 3.5 mm.; similar to fore wing, except that the apical branch of pterostigmal band, the inner small Y-shaped band of apical band and the basal band are greatly reduced. ♀ genitalia: subgenital plate abruptly narrow posteriorly, with a wide U-shaped distal incision; internal skeleton small, being U-shaped, with a small stalk at its base, the axis apparently absent.

♂ unknown.

Holotype (♀): Moupin, Sikang; July 29, 1941; Chuan Lung Lee: in my own collection.

This species differs from described *Neopanorpa* by its additional small Y-shaped band between the pterostigmal and apical bands in the fore wings. The stalk bearing U-shaped internal skeleton of the female enables its easy recognition.

Neopanorpa varia n. sp.

Figures 41, 42, 56

Body light brown, black above, last few abdominal segments brown, vertex entirely black; rostrum light brown with black stripe on each side. Fore wing: length, 14 mm.; width, 3.2 mm.; membrane slightly brown, markings sooty brown; pterostigmal band complete, with a separated basal branch and a narrow apical branch; apical band complete; pterostigma prominent. Hind wing: length, 13 mm.; width, 3.3 mm.; similar to fore wing, except that the basal band is represented by a small marking on the hind margin. ♀ genitalia: subgenital plate broad, with a U-shaped distal incision; internal skeleton large, U-shaped, posterior arms rather long, obtuse distally, very large basally, with a narrow sclerotized bridge and a rounded membranous portion between them, axis apparently absent.

♂ unknown.

Holotype (♀): Heierhwan, 100 miles south of Tachienlu, Sikang; Sept. 20, 1939; F. Y. Cheng, Io Chou and Tein Ho Hei; in my own collection. *Paratypes*: 1 ♀ Jihti, 20 miles east of Tachienlu, Sikang; Sept. 2, 1939; 1 ♀ Tienwan, 30 miles south of Tachienlu, Sikang; Sept. 9, 1939; 1 ♀ Wantung, 50 miles south of Tachienlu, Sikang; Sept. 17, 1939; F. Y. Cheng, Io Chou and Tien Ho Hei; in my own collection.

This species is somewhat variable with regard to the markings of the wings; in my collection, there is one individual collected in Wantung, Sikang, with a greatly reduced pterostigmal band on both fore and hind wings and without the basal band on the hind wing.

This species resembles *chelata* Carp. in wing markings, but differs greatly in the structure of the female genitalia. The internal skeleton of this species resembles *banksi* Carp. superficially, but differs in its basal structure as compared with the three well-developed plates which appear on the base of the internal skeleton of *banksi* Carp. The wings of this species differ from

those of *caveleriei* Navas by the absence of a transverse marking which joins the pterostigmal and apical bands at the anterior margin of the wing. The wings of this species resemble those of *dimidiata* Navas, but the body color differs very much. However, the specific characteristics cannot be determined with certainty until the structure of the 9th abdominal segment has been studied.

FAMILY BITTACIDÆ

Genus *Bittacus* Latr.

This genus has been represented in China (not including Formosa) by four species, of which *sinensis* was described by Walker, *pieli* by Navas, and *triangularis* and *sinicus* by Issiki.

Bittacus planus n. sp.

Figures 59, 60, 61, 63, 67

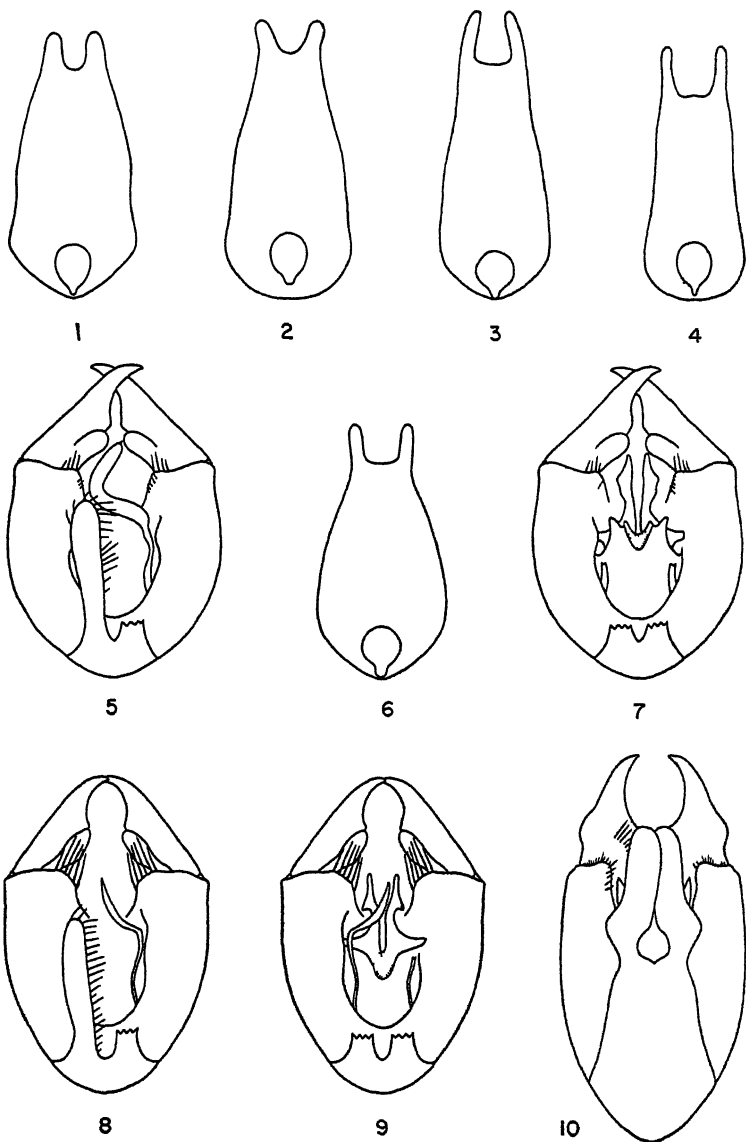
Body light brown, vertex brown, with sooty brown marking enclosing ocelli; rostrum brown; meso-thorax with two sooty brown spots on each side dorsally. Fore wing: length, 20.2 mm.; width, 5.2 mm.; the wing apex broad, obtuse; membrane light brown without markings, veins brown, cross veins slightly emarginated; pterostigma not very prominent, apical cross vein in the area between Cu2 and 1A absent. Hind wing: length, 17.5 mm.; width, 4.2 mm.; similar to fore wing, except that there is only one cross vein between the pterostigma and R2. ♂ genitalia: preëpiproct with V-shaped inner margins, when seen from above, with truncated apex, the apical margins being slightly concave, furnished with a series of short black bristles on its interior sides; caudal end of coxopodites produced upward rather long with smooth apex; harpagones broad basally, very narrow and slender distally, with prominent inner process; ædeagus lobes on each side of the base of flum broaden towards apex with truncated tips; proctiger narrow towards apex, furnished with a bundle of short hairs; the lower process very long, pointed towards its apex.

Holotype (♂): Mt. Taipai, Shensi, June, 1942; Io Chou; in my own collection. *Paratypes*: 1 ♂, 1 ♀, same collecting data as holotype; in the Museum of Comparative Zoology. 2 ♂, 3 ♀, same collecting data as holotype; in National Northwest College of Agriculture, Wukung, Shensi.

This species differs from the previously described species by the peculiar shape of the preëpiproct in lateral view, the slender harpagones and the broadened apex of the ædeagus lobes.

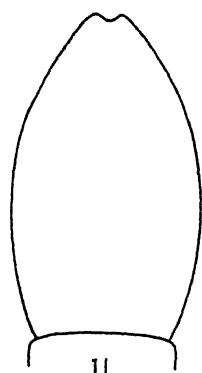
EXPLANATION OF PLATE 7

- Fig. 1. *Panorpa emarginata* n. sp., preëpiproct of ♂. (Holotype).
Fig. 2. *Panorpa obtusa* n. sp., preëpiproct of ♂. (Holotype).
Fig. 3. *Panorpa typicoides* n. sp., preëpiproct of ♂. (Holotype).
Fig. 4. *Panorpa sexspinoso* n. sp., preëpiproct of ♂. (Holotype).
Fig. 5. *Panorpa fructa* n. sp., ventral view of ♂ genital bulb. (Holotype).
Fig. 6. *Panorpa fructa* n. sp., preëpiproct of ♂. (Holotype).
Fig. 7. *Panorpa fructa* n. sp., ventral view of ♂ genital bulb. (Holotype).
Fig. 8. *Panorpa sexspinoso* n. sp., ventral view of ♂ genital bulb. (Holotype).
Fig. 9. *Panorpa sexspinoso* n. sp., ventral view of ♂ genital bulb, showing ædeagus. (Holotype).
Fig. 10. *Neopanorpa taoi* n. sp., ventral view of ♂ genital bulb. (Holotype).

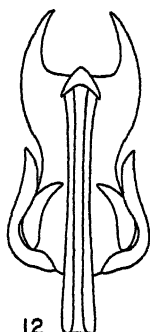


EXPLANATION OF PLATE 8

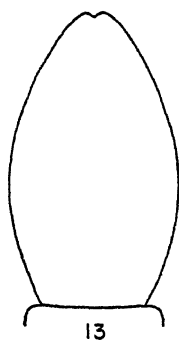
- Fig. 11. *Panorpa emarginata* n. sp., subgenital plate of ♀. (Allotype).
Fig. 12. *Panorpa emarginata* n. sp., internal skeleton of ♀. (Allotype).
Fig. 13. *Panorpa typicoides* n. sp., subgenital plate of ♀. (Allotype).
Fig. 14. *Panorpa typicoides* n. sp., internal skeleton of ♀. (Allotype).
Fig. 15. *Panorpa sexspinoso* n. sp., subgenital plate of ♀. (Allotype).
Fig. 16. *Panorpa sexspinoso* n. sp., internal skeleton of ♀. (Allotype).
Fig. 17. *Panorpa leei* n. sp., subgenital plate of ♀. (Holotype).
Fig. 18. *Panorpa leei* n. sp., internal skeleton of ♀. (Holotype).
Fig. 19. *Panorpa semifasciata* n. sp., ventral view of ♀ last few abdominal segments. (Holotype).
Fig. 20. *Panorpa semifasciata* n. sp., internal skeleton of ♀. (Holotype).
Fig. 21. *Panorpa semifasciata* n. sp., subgenital plate of ♀. (Holotype).
Fig. 22. *Neopanorpa choui* n. sp., subgenital plate of ♀. (Allotype).
Fig. 23. *Neopanorpa choui* n. sp., internal skeleton of ♀. (Allotype).



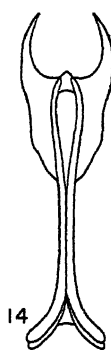
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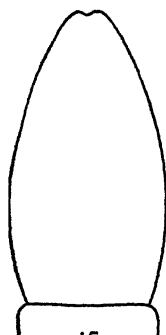
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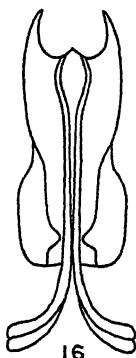
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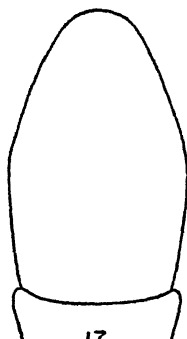
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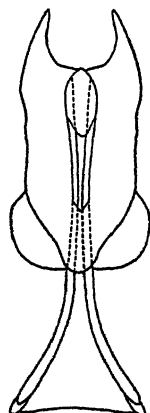
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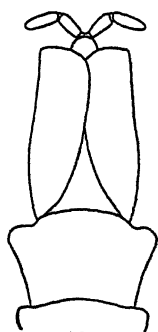
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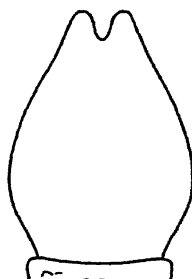
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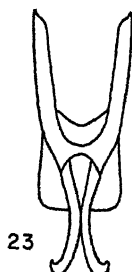
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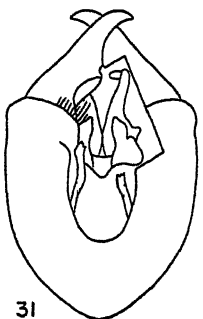
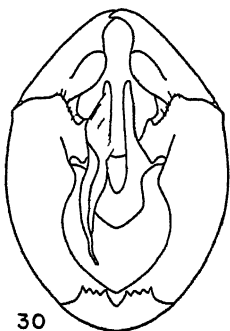
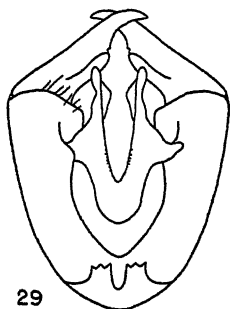
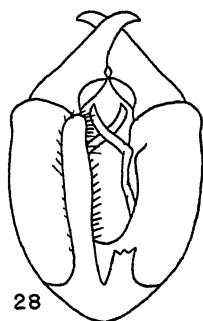
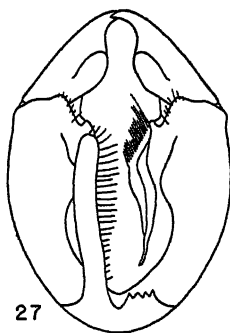
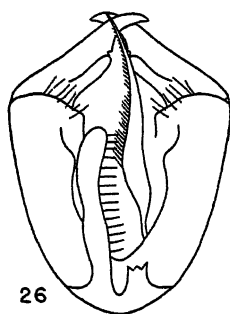
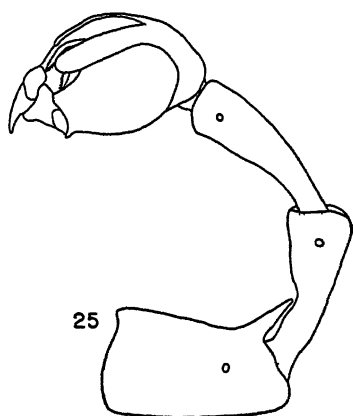
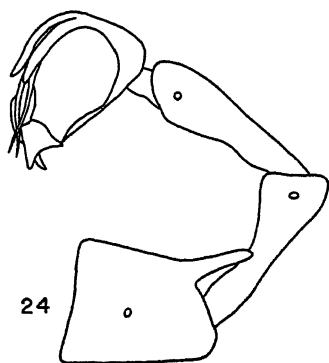
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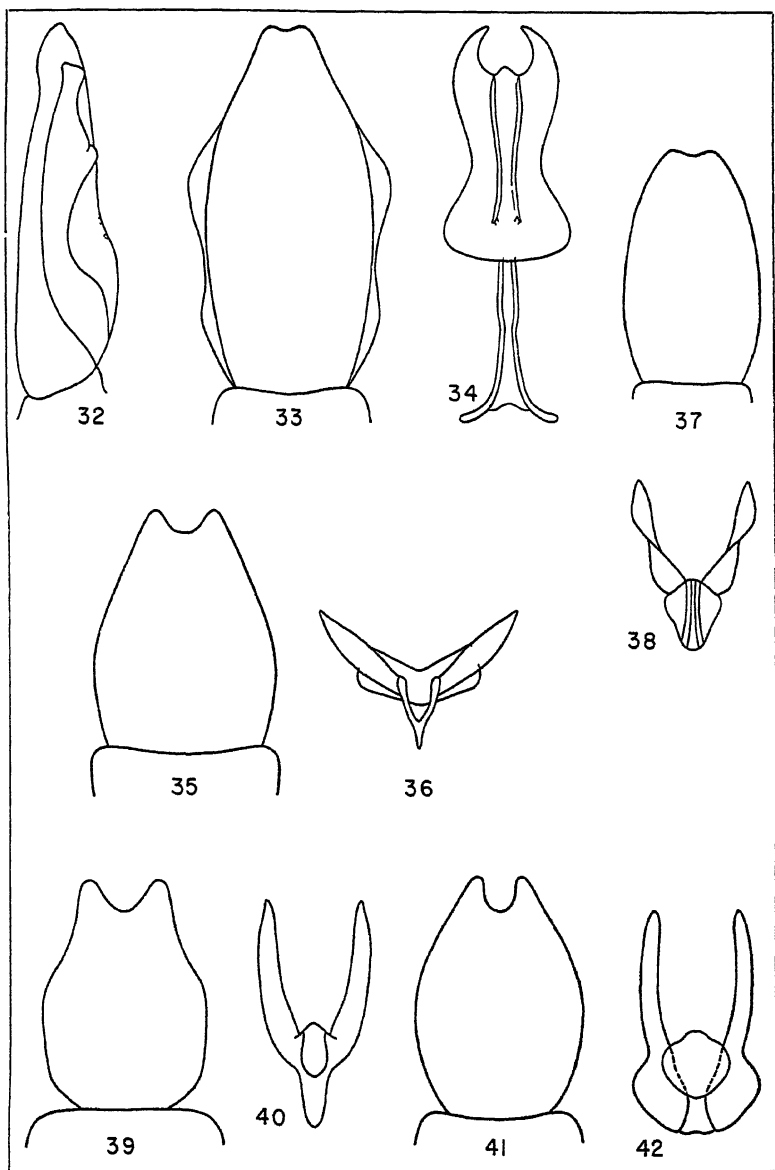
EXPLANATION OF PLATE 9

- Fig. 24. *Panorpa emarginata* n. sp., lateral view of ♂ last few abdominal segments. (Holotype).
- Fig. 25. *Panorpa obtusa* n. sp., lateral view of ♂ last few abdominal segments. (Holotype).
- Fig. 26. *Panorpa emarginata* n. sp., ventral view of ♂ genital bulb. (Holotype).
- Fig. 27. *Panorpa obtusa* n. sp., ventral view of ♂ genital bulb. (Holotype).
- Fig. 28. *Panorpa typicoides* n. sp., ventral view of ♂ genital bulb. (Holotype).
- Fig. 29. *Panorpa emarginata* n. sp., ventral view of ♂ genital bulb, showing ædeagus. (Holotype).
- Fig. 30. *Panorpa obtusa* n. sp., ventral view of ♂ genital bulb, showing ædeagus. (Holotype).
- Fig. 31. *Panorpa typicoides* n. sp., ventral view of ♂ genital bulb, showing ædeagus. (Holotype).



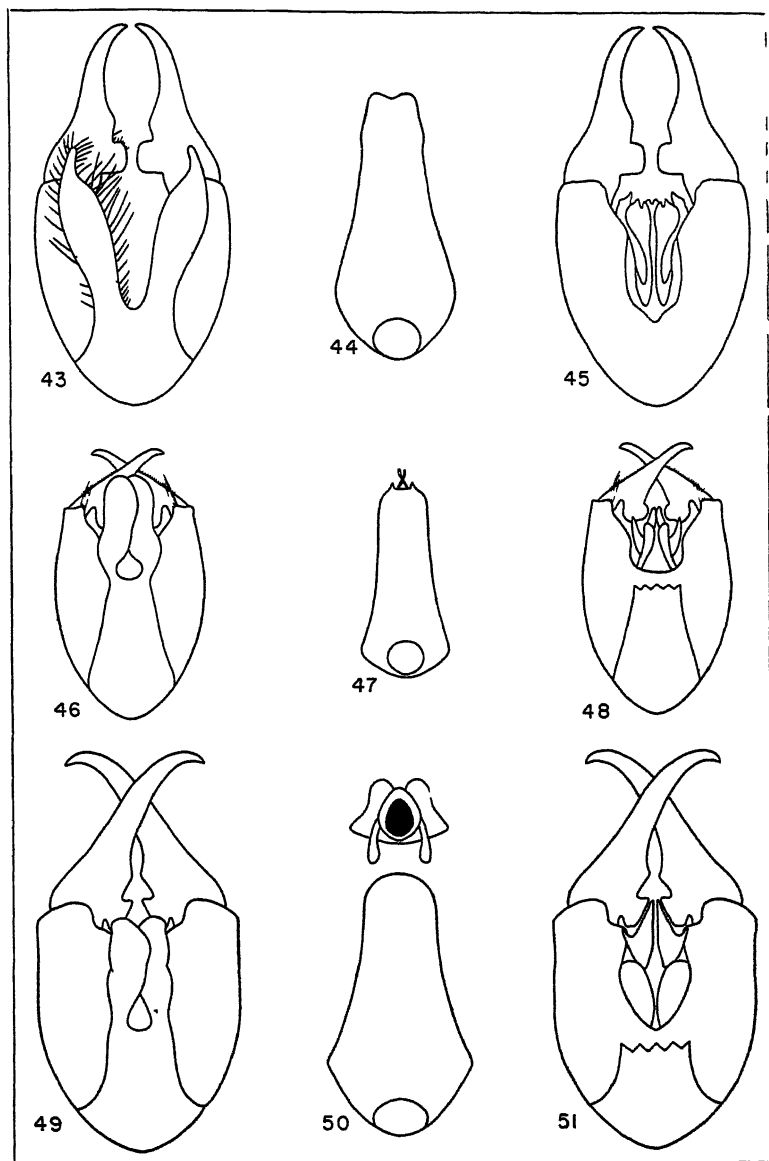
EXPLANATION OF PLATE 10

- Fig. 32. *Panorpa statura* n. sp., lateral view of subgenital plate of ♀. (Holotype).
Fig. 33. *Panorpa statura* n. sp., subgenital plate of ♀. (Holotype).
Fig. 34. *Panorpa statura* n. sp., internal skeleton of ♀. (Holotype).
Fig. 35. *Neopanorpa heii* n. sp., subgenital plate of ♀. (Allotype).
Fig. 36. *Neopanorpa heii* n. sp., internal skeleton of ♀. (Allotype).
Fig. 37. *Panorpa pusilla* n. sp., subgenital plate of ♀. (Holotype).
Fig. 38. *Panorpa pusilla* n. sp., internal skeleton of ♀. (Holotype).
Fig. 39. *Neopanorpa latipennis* n. sp., subgenital plate of ♀. (Holotype).
Fig. 40. *Neopanorpa latipennis* n. sp., internal skeleton of ♀. (Holotype).
Fig. 41. *Neopanorpa varia* n. sp., subgenital plate of ♀. (Holotype).
Fig. 42. *Neopanorpa varia* n. sp., internal skeleton of ♀. (Holotype).



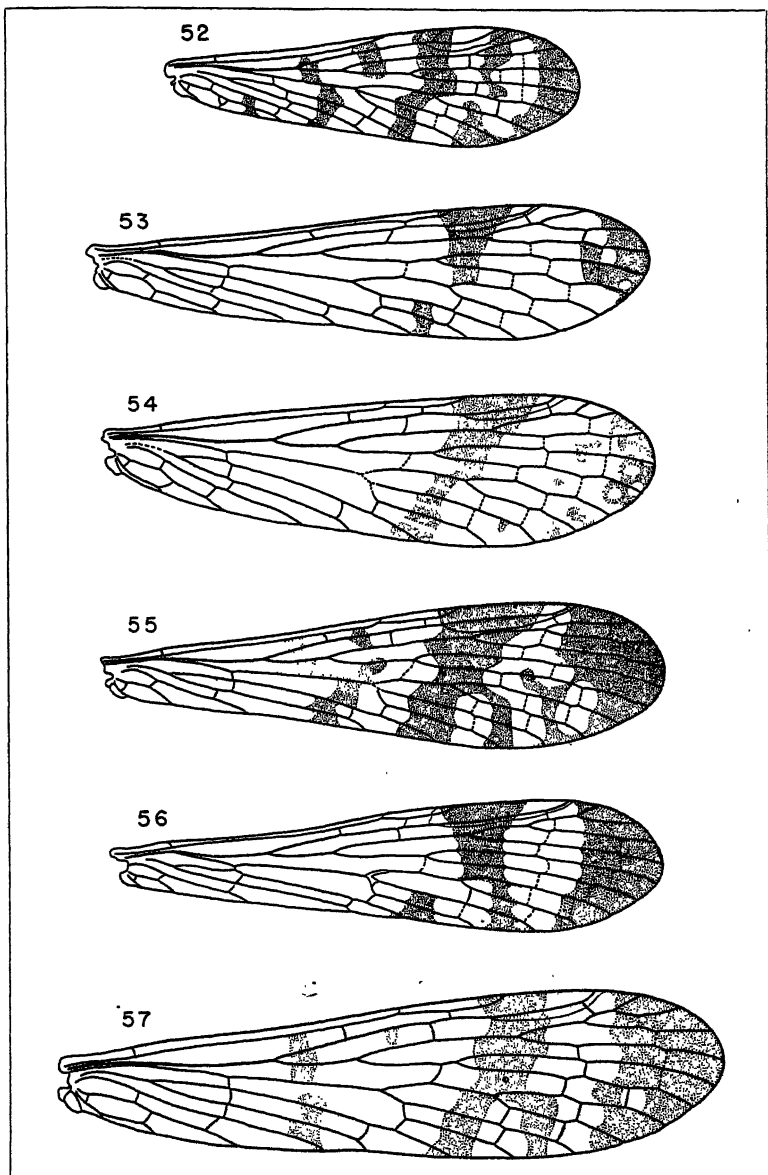
EXPLANATION OF PLATE 11

- Fig. 43. *Neopanorpa choui* n. sp., ventral view of ♂ genital bulb. (Holotype).
- Fig. 44. *Neopanorpa choui* n. sp., preëpiproct of ♂. (Holotype).
- Fig. 45. *Neopanorpa choui* n. sp., ventral view of genital bulb, showing ædeagus. (Holotype).
- Fig. 46. *Neopanorpa validipennis* n. sp., ventral view of ♂ genital bulb, (Holotype).
- Fig. 47. *Neopanorpa validipennis* n. sp., preëpiproct of ♂. (Holotype).
- Fig. 48. *Neopanorpa validipennis* n. sp., ventral view of ♂ genital bulb, showing ædeagus. (Holotype).
- Fig. 49. *Neopanorpa heii* n. sp., ventral view of ♂ genital bulb. (Holotype).
- Fig. 50. *Neopanorpa heii* n. sp., preëpiproct of ♂. (Holotype).
- Fig. 51. *Neopanorpa heii* n. sp., ventral view of ♂ genital bulb, showing ædeagus. (Holotype).



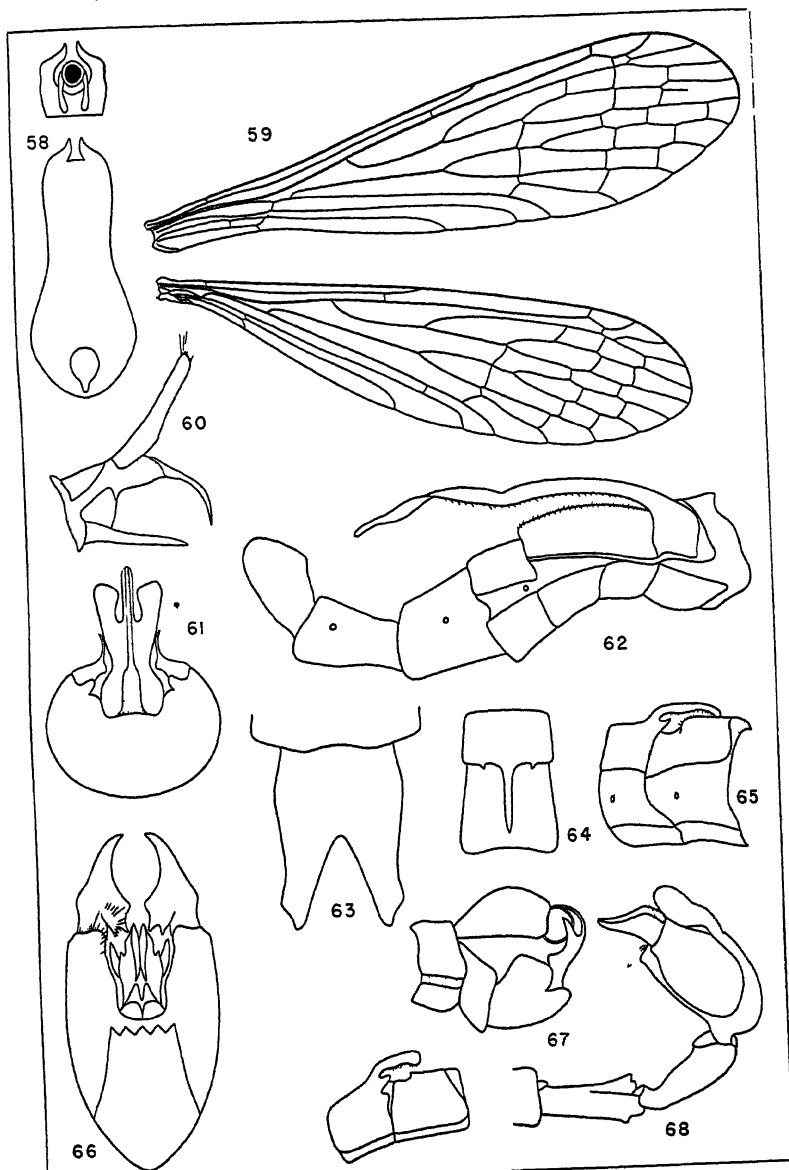
EXPLANATION OF PLATE 12

- Fig. 52. *Panorpa pusilla* n. sp., fore wing of ♀. (Holotype).
Fig. 53. *Panorpa semifasciata* n. sp., fore wing of ♀. (Holotype).
Fig. 54. *Panorpa leei* n. sp., fore wing of ♀. (Holotype).
Fig. 55. *Neopanorpa latipennis* n. sp., fore wing of ♀. (Holotype).
Fig. 56. *Neopanorpa varia* n. sp., fore wing of ♀. (Holotype).
Fig. 57. *Panorpa statura* n. sp., fore wing of ♀. (Holotype).



EXPLANATION OF PLATE 13

- Fig. 58. *Neopanorpa taoi* n. sp., preëpiproct of ♂. (Holotype).
Fig. 59. *Bittacus planus* n. sp., wings of ♂. (Holotype).
Fig. 60. *Bittacus planus* n. sp., terminal abdominal appendages, lateral view of the proctiger. (Holotype).
Fig. 61. *Bittacus planus* n. sp., terminal abdominal appendages, dorsal view. (Holotype).
Fig. 62. *Neopanorpa choui* n. sp., lateral view of ♂ abdominal segments, showing long median process. (Holotype).
Fig. 63. *Bittacus planus* n. sp., terminal abdominal appendages, caudal view. (Holotype).
Fig. 64. *Neopanorpa validipennis* n. sp., dorsal view of the median process of ♂. (Holotype).
Fig. 65. *Neopanorpa validipennis* n. sp., lateral view of the median process of ♂. (Holotype).
Fig. 66. *Neopanorpa taoi* n. sp., ventral view of ♂ genital bulb, showing ædeagus. (Holotype).
Fig. 67. *Bittacus planus* n. sp., terminal ♂ abdominal appendages, lateral view. (Holotype).
Fig. 68. *Neopanorpa taoi* n. sp., lateral view of abdominal segments of ♂. (Holotype).



SEVENTY-FIFTH ANNIVERSARY OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.—As this issue of *Psyche* goes to press, plans are being made for a 75th anniversary meeting of the Cambridge Entomological Club, on December 20, 1949. The Club was formed on January 9, 1874, by thirteen local entomologists, who met at Dr. Hagen's house. In addition to Hagen the group included Samuel Scudder, A. S. Packard, Samuel Henshaw, Edward Burgess, George Dimmock, J. H. Emerton, E. Schwarz, E. P. Austin, B. P. Mann, J. C. Munro, G. R. Crotch and H. R. Morrison. The first scientific communication of that evening was a discussion by Dr. Hagen of an amber insect from Maryland. At the fourth meeting, on April 10, 1874, the members voted to publish a monthly journal, named *Psyche*. Five hundred printed copies of the first issue were brought to the next meeting, on May 8. Within the next few years many well-known entomologists joined the Club, among them being H. R. Grote, Baron Osten-Sacken, Samuel Williston, J. L. Leconte, C. V. Riley, J. A. Lintner and W. H. Edwards. The Club was incorporated on February 9, 1877. Most of the early meetings were held at Scudder's house, on Brattle St., Cambridge. After 1900 the group met at either the Boston Society of Natural History building or the Appalachian Mountain Club rooms. Subsequent to the appointment of W. M. Wheeler at Harvard University in 1910, the meetings have been held at one of the University's buildings—the Bussey Institution until 1931, and the Biological Laboratories from then until the present time. The 75th Anniversary Meeting will be the 647th meeting since the formation of the Club. *Psyche* is now in its 56th volume.—F. M. CARPENTER.

ACANTHEPEIRA VENUSTA (BANKS)
(ARANEÆ)¹

BY ELIZABETH B. BRYANT

Museum of Comparative Zoology

Among the collection of spiders in the Museum of Comparative Zoology, several specimens including both sexes of *Acanthepeira venusta* (Banks), from various localities in Florida, were identified. The male has never been recognized before, and as the original description was based on a female, a more complete description of both sexes with figures seems desirable.

The genus *Acanthepeira* appears in the list of Arachnida by Marx in Howard's "List of the Invertebrate Fauna of South Carolina" 1883, used for the species *Epeira stellata* Walck., 1805. As Howard's list is quite rare, it is not surprising that the Marx genus has been overlooked. In 1892, McCook proposed the genus *Marxia* for the same species, *Epeira stellata* Walck. The generic description lists few structural characters and is based largely on the marginal tubercles of the abdomen and the width of the clypeus, characters that are shared by other genera of the family. So in 1904, F.O.P.-Cambridge redescribed the genus using more definite characters. This definition has been generally accepted. In 1941, Archer reinstated the generic name, *Acanthepeira* and it has also been recently used by Kaston in the "Spiders of Connecticut," 1948.

Acanthepeira venusta (Banks)

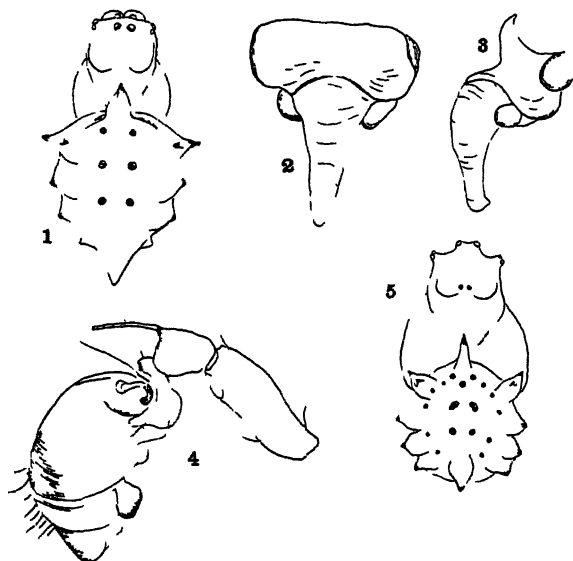
Figures 1-5

Plectana venusta Banks, 1896, p. 69. "♀ Florida; Punta Gorda."

Female. Length, 6.0 mm., ceph. 3.0 mm. long, 2.2 mm. wide, abd. 4.2 mm. long without the anterior and posterior tubercles, 4.0 mm. wide.

¹ Published with a grant from the Museum of Comparative Zoology at Harvard College.

Cephalothorax brown, cephalic portion pale and covered with white hairs, a pair of large circular elevations directly posterior to the eyes, anterior margin wide and truncate; *eyes* in three groups, seen from the front, the anterior row procurved, median eyes carried forward on a small lobe, a.m.e. smaller than the p.m.e., separated by about two diameters, p.m.e. separated by a diameter, lateral eyes subequal on a distinct tubercle at the extreme angle of the carapace; *quadrangle* higher than wide and as wide in front as behind; *clypeus* below the a.m.e. as high as the quadrangle: *mandibles* brown, vertical, fang



Figs. 1-5. *Acanthepeva venusta* (Banks) Fig. 1. Female, dorsal, (type); fig 2 Epigynum, ventral; fig. 3. Epigynum, lateral, fig. 4. Left palpus, retrolateral, fig 5. Male, dorsal.

groove oblique, upper margin with a row of black bristles followed by three teeth, lower margin with four subequal, contiguous teeth, fang short; *labium* wider than long, basal half dark, tip pale; *sternum* lateral margins dark, triangular, one and a half times as long as broad, fourth coxæ touching; *abdomen* pale, with a vague folium on the

posterior half, with ten tubercles on the margin, each with a corneous tip, the pointed anterior median tubercle extends well over the cephalothorax, the posterior median tubercle blunt and hairy, and the tip darker, as wide at the base as it is long, extends well over the spinnerets, four pairs of graduated lateral tubercles, the largest at the lateral angles, bifid at the tip, the posterior pair very small and not in line with the other pairs, venter infuscate with a pale transverse bar posterior to the epigynum; *legs*, 1-2-4-3, rather short, brown, with darker brown rings, more distinct on the ventral side, spines shorter than the diameter of the joint, no ventral spines on the femora, a dorsal basal spine on III and IV tibiae; *epigynum*, area longer than wide, a narrow chitimized base, from which projects a slender, graduated fleshy scape, fully twice as long as the chitimized base, tip curled inward, each side of the base a circular opening, with a second smaller opening at the base of the scape.

Male. Length, 6.2 mm., ceph. 4.0 mm. long, 3.4 mm. wide, abd. 3.0 mm. long, 2.9 mm. wide.

Cephalothorax dark brown, broader than in the female and the anterior margin much narrower, many pale hairs in the ocular area, the circular elevations posterior to the eyes more distinct than in the female, with a pair of dark dots close together as figured; *eyes*, median eyes carried forward on a lobe, lateral eyes on distinct tubercles; *mouth parts* and *sternum* as in the female; *abdomen* with the tubercular pattern as in the female, except that the anterior median tubercle is more slender, and the posterior median tubercle is cone-shaped and extends upward at almost right angles to the abdomen, not a longitudinal extension, the muscle spots large and chitimized with numerous small chitimized flecks on the dorsum; *legs*, 1-2-4-3, brown, with darker rings on all joints, legs longer than in the female, with no hook on the first and second coxae, a coniform spur on the fourth coxa, second tibia not incrassate, nor with any specialized spines, spines longer than in the female, a retrolateral row of spines on the fourth femur, with two short chitimized

spurs on tubercles near the base; *palpus* not as long as the cephalothorax, patella with one long stout bristle at the tip, tibia not as long as the patella, swollen ventrally, with a long pale, retrolateral process extending dorsally with several long colorless bristles near the tip, paracymbium in two parts, the ventral section small, of the typical form, dark and strongly chitinized and almost touching the tip of the ventral process, the dorsal portion pale, larger, with a recurved tip, the basal part of the cymbium depressed, cymbium not covering all parts, embolus an obscure process near the tip.

Holotype ♀ Florida; Punta Gorda, Banks Coll., no. B.0183. Allotype (by present designation) ♂ Florida; Royal Palm Park, 25–30 March 1927, (Blatchley).

Additional material, not types: 2 ♂s Georgia; Waycross, August 1903, (Morse), Emerton Coll.; ♀ Florida; Coconut Grove, July 1929, (Fairchild); ♂ ♀ Florida; Royal Palm Park, 25–30 March 1927; ♂ ♀ 1–18 April 1927; ♀ 5–17 December 1927, (Blatchley); ♂ ♀ Florida; Dade Co., Paradise Key, from a nest of mud dauber, 23 May 1927 (Dow).

Cambridge had but one species of *Marxia* from Central America when he defined the genus and he states that the species identified as *stellata* from Mexico and Guatemala may not be the same species as figured by Emerton in the Epeiridæ of New England, 1884.

Acanthepeira venusta differs from the generic description as given by Cambridge in three structural characters. The p.m.e. are larger than the a.m.e.; the quadrangle is as wide behind as in front, and it is distinctly longer than wide; the lower margin of the fang groove has four teeth.

The males of *A. venusta* can be separated from *A. stellata* by the narrower abdomen with the terminal tubercle turned upward, the much narrower ventral apophysis on the tibia of the palpus and the paracymbium. The females can be separated from *A. stellata* by the narrower abdomen and the epigynum.

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FURTHER DESCRIPTION OF *POLYPLAX* *ALASKENSIS* EWING (ANOPLURA)¹

By W. B. QUAY

Biological Laboratories, Harvard University

Polyplax alaskensis was first described by H. E. Ewing (1927, Proc. Ent. Soc. Wash., 29: 118-121) from a single male taken from a mouse, *Microtus* sp., in Alaska. No subsequent collecting records of this species have been found in the literature. During the summer of 1948 a large series of individuals of both sexes was secured from mice, *Microtus o. operarius* (Nelson), collected on the Seward Peninsula by the writer. Since the original description is brief and unfigured, I am including here a further description of the species based on the numerous specimens now at hand.

Acknowledgments are made to J. C. Bequaert of the Museum of Comparative Zoology and to Floyd G. Werner of the Harvard Biological Laboratories for aid and advice. I am also very grateful to C. F. W. Muesebeck of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, for corroborating the identification by comparing a specimen from my series with the type.

FEMALE (Fig. 1. A). Length 1.2-1.4 mm. *Head* almost as broad as long and generally similar to that of *spinulosa*; first antenna joint much longer than the others and set close to the anterior margin. *Thorax* dorsally similar to that of *spinulosa*; ventrally, the sternal plate is longer than it is broad; the anterior lateral margins are nearly parallel; the posterior lateral margins are concave and slope to a blunt point; the legs, of usual form, are of increasing size posteriorly.

Pleural plates: (Fig. 2, B) first pleurite elongate, faintly if at all chitinized medially and usually with three

¹ Published with a grant from the Museum of Comparative Zoology at Harvard College.

setæ anteriorly on the ventral lobe, and one anteriorly on the dorsal lobe; the ventral marginal seta of the first pleurite is usually more than twice the length of the dorsal seta and may approach the length of the pleurite itself; second pleurite, elongate and attenuated anteriorly, the ventral marginal seta exceeds the dorsal in length and is usually about half the length of the pleurite; third pleurite, elongate and attenuated anteriorly, with the spiracle barely inclosed by the ventral margin, and with the dorsal marginal seta the same length as that of the second pleurite

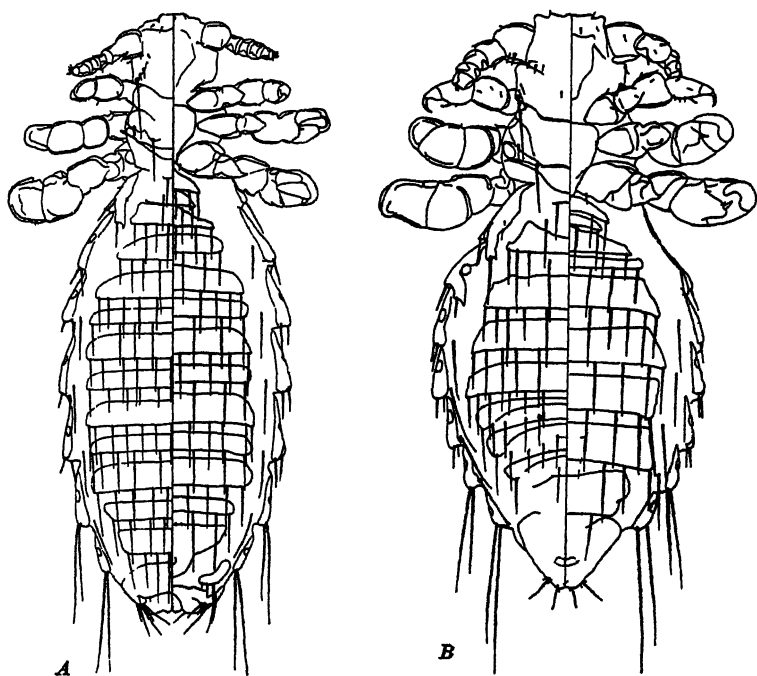


Figure 1. *Polyplax alaskensis*. A. Female. B. Male.

rite but longer than the ventral marginal seta of its own pleurite; the spiracles of the third to seventh pleurites are uniformly large and are progressively more centrally

located; pleurites four and five are less elongate and are progressively less attenuated anteriorly, the dorsal marginal setæ are longer than the ventral; pleurite six is narrow and tapers anteriorly; the seventh pleurite is narrow and very blunt anteriorly; in the sixth and seventh pleurites the chitinized area at the base of the marginal setæ is progressively more isolated from the anterior and major portion of the pleurite, and the marginal setæ are greatly elongated, the ventral ones being somewhat longer than the dorsal.

Tergal and sternal plates of the abdomen are well chitinized and cover most of the surface area, the anterior plate of each segment tending to be larger than the posterior; on their posterior margins most of the tergites have from eight to thirteen setæ and most of the sternites have from six to ten; however, there is considerable variation in these numbers. The first abdominal sternite is much wider than the second, is pointed anteriorly and concave posteriorly; the second abdominal sternite is almost a half circle; the third is more than twice the width of the second and has a pointed anterior margin. Between the ends of the posterior plate and the corresponding pleurite on the fourth to seventh segments dorsally and the third to seventh ventrally, there is a single seta of moderate length. Ventral to and parallel with the posterior margin of the seventh pleurite, a small plate, bearing three setæ on the posterior margin, has a lobe directed anteriorly from its lateral half.

MALE (Fig. 1, B). Length 0.8–1.0 mm. As described by Ewing, except for the following modifications and additions. Sternum usually longer than it is broad and may sometimes overlap the second and third coxæ.

Tergal and sternal plates of the abdomen are well developed. The first large tergite is usually strongly concave and irregular along its anterior border; the second, third, and fourth tergites progressively increase in length and are convex anteriorly; the fifth, sixth, and seventh tergites are progressively reduced in size and only in a narrow zone near their anterior margins are they strongly

chitinized. First three sternites are strongly convex anteriorly and are quite long; the third is much longer than the other two and the central area of its anterior margin is produced into a pointed lobe limited laterally by the base of a large seta; the greatest length of the third sternite distinctly exceeds that of the fourth and is about half that of the following four sternites; all five have roughly parallel and straight anterior and posterior borders.

Genitalia (Fig. 2, A) as described by Ewing and figured here.

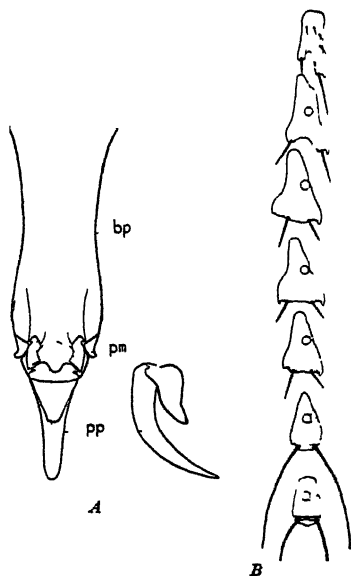


Figure 2. *Polyplax alaskensis*. A. Genitalia of males: bp, basal plate; pm, parameres; pp, pseudopenis (also shown in oblique view). B. Pleural plates of female (setae of the sixth and seventh are abbreviated).

Specimens examined: twenty-four of both sexes and different ages, collected at Cloud Lake (near Asses Ears), Seward Peninsula, Alaska, July 27, 1948. Representative specimens have been deposited in the collections of the Museum of Comparative Zoology and the National Museum.

A NEW AFRICAN MILLIPED OBSERVED IN MIGRATION

BY RALPH V. CHAMBERLIN

University of Utah

The mass migration of millipeds is a phenomenon that has been observed in species of various families of Julida, Spirobolida and Polydesmida. The phenomenon has never been adequately studied or explained. To the list of those observed in such migration may now be added an African member of the Spirostreptida, herein first named and described. Dr. Neal A. Weber, who collected specimens and submitted them to me for identification, supplies the following on the occurrence and behavior of this form as he noted them in the field:

"The animals were discovered Mar. 2, 1948 at the junction of the Vele and Bomokandi Rivers, Lat. 3°38' N. and Long. 26°8' E. There were thousands milling about at the river's edge and many had crawled into the river and drowned. There were at least 500 millipeds in one place hanging on a nearly vertical slope of the river bank. In an area of a hundred square meters there were at least 5,000 or that order of magnitude and they were spread over about 150 meters along the river's edge. The air temperature was 89.5° F. Eight kilometers away a few of the same animals were to be found as well as smaller numbers between that point and the river. This was the time approaching the end of the dry season, and it may well be that the population had gradually built up to this peak and migration ensued. There were no animals preying on these and no obvious cause impelling their migration in this direction and into the river where they drowned. The land was not flooded back of this area."

Zantekius, new genus

A genus of the Spirostreptidæ related to *Mardonius* and *Eumekius* of Central Africa and Madagascar. Spiracles beginning on the sixth segment. Metazonites without trace of longitudinal keels, being smooth above and striate

below. Anal valves not spined. In the posterior gonopods of the male the coxa without trace of spines and set off distinctly from the telopodite; telopodite long and slender, not at all laminate and entirely without lobes or branches. The inner lamina of the anterior gonopods much produced distad, presenting on the outside at level of the gonocoel a lobe directed proximad and on mesal side near distal end a large T-shaped lobe with one arm directed distad and the other proximad.

Generotype: *Zantekius weberi*, new species.

This genus differs from *Mardonius* in lacking a femoral lobe or spine on the posterior gonopod and from *Eumekius* in having an ectal cone or lobe on the median lamella of the anterior gonopod as well as in having the conspicuous mesal lobe.

Zantekius weberi, new species

Metazonites black about caudal borders, anteriorly more grayish, the last segment entirely gray or grayish brown. Head with face below level of antennæ reddish. Legs and antennæ red, contrasting sharply with the dark body.

Labral excavation very shallow. Labral pits 2-2, the front of head elsewhere smooth, wholly without rugæ. Eyes with inner angles extending mesad a little beyond base of antennæ, the two separated by somewhat more than their transverse length: individual ocelli convex and distinct. Median sulcus across vertex fine, ending in a slightly depressed pit at level of inner angles of eyes. No interocular sulcus evident except faintly for a short distance each side of end of vertigial sulcus. Antennæ reaching to third segment.

Collum moderately narrowing on each side from level of eye ventrad; in the male produced forward at lower anterior corner, with three deep sulci in addition to the margining sulcus as shown in the accompanying figure (Fig. 1A); not produced in the female.

Encircling striæ of prozonites of the other segments fine, mostly about six in number. The surface of the metazonites above and laterally entirely smooth and shin-

ing. Each somite with diameter greatest at caudal border, decreasing gradually forward excepting for the moderate depression between prozonite and metazonite. Segmental sulcus fine but sharply defined throughout.



Fig. 1, A. Left side of collum of male. B. Left gonopod of male, with sternite, anterior view.

The usual sharply impressed longitudinal sulci across the metazonite below, the series ending considerably below level of repugnatorial pore. Each pore located well in front of middle of metazonite.

Dorsal line of anal tergite as seen in profile nearly straight. Anal valves distinctly exceeding the tergite; mesal borders strongly elevated. Caudal margin of anal scale weakly obtusely angular.

Ventral pads present on penult and antepenult segments of most of the legs, these pads produced into a short lappet at their distal end beneath the succeeding joint.

The distinctive features of the anterior and posterior gonopods are shown in fig. 1, B.

Type locality: Africa: Belgian Congo, near Bembi, at junction of Vele and Bomokandi Rivers. Mar. 2, 1948. Many specimens collected by Dr. Neal A. Weber.

SOME AMERICAN SALDIDÆ (HEMIPTERA)¹

BY CARL J. DRAKE

Ames, Iowa

The present paper is based largely upon Saldidæ in the Museum of Comparative Zoology, Harvard University. Some records from the author's private collection are also included. The disposition of types is given beneath the descriptions of new species.

Micracanthia pusilla Van Duzee

Lake Tahoe, Calif., 1 specimen, Aug. 8, 1937, C. J. Drake and Floyd Andre; Ft. Collins, Colo., 1 specimen, May 3, 1898, E. D. Ball; Georgetown, Colo., 7 specimens, July 27, 1898, W. J. Gerhard; Provo, Utah, Aug. 10, 1930, E. D. Ball.

Pentacora bruesi, sp. n.

Plate 14

Small, broadly ovate, blackish, slightly shining, with yellowish brown markings along exterior margins of hemelytra. Head rather broad, black, a narrow crescentric streak along inner margin of each eye and head in front (including callosities) flavous, the ocelli amber; eyes dark, rather large. Antennæ moderately long, moderately hairy; segment I stout, flavous; with a few scattered setæ; II yellowish brown; III and IV dark brown, the last three segments with some scattered long hairs; proportions: I, 20; II, 38; III, 28; IV, 32. Rostrum yellowish brown, extending to hind coxæ. Legs testaceous, sparsely hairy, with scattered brown spots; coxæ becoming dark basally, the front coxal plates largely whitish. Body beneath black, the venter brownish black, the pubescence pale, reclining posteriorly.

Pronotum broad, moderately narrowed anteriorly, three times as wide as long, broadly excavated behind, the

¹ Published with a grant from the Museum of Comparative Zoology at Harvard College.

lateral margins a little rounded, with a few short hairs along the edges; front margin rather wide, extending laterally a little beyond the middle of each eye, pubescence yellowish, reclining; callus large, shining, moderately convex, not extending on lateral margins, extending posteriorly beyond middle of pronotum, with large discal impression and a smaller one on each side, the discal impression with deep furrow leading posteriorly to the end of sulcus; transverse sinuate impression separating lobes not very deep, not conspicuously pitted at the bottom; hind lobe indistinctly rugulose, about one-fourth the length of the frontal; sides of pronotum narrowly embrowned along the margins, the sides beneath widely flavous. Scutellum black, slightly shining, slightly rugulose, the transverse impression placed slightly before the middle. Hemelytra brownish black, with six or seven rounded, bluish, sericeous spots on each side, the pubescence yellowish, moderately long, somewhat decumbent, yellowish; clavus dull, grayish black, with a sericeous, yellowish spot before the apex; corium within concolorous with clavus, the rest largely black-fuscous, with five or six pale sericeous spots; embolium, save base, narrowly margined with flavous, the flavous color wider near base and before apex, there extending a little into corium; membrane largely whitish, black within at base, with five cells (only four on right wing, the outer vein being absent) each cell with a small spot before apex, the spots forming together a transverse fuscous streak, the veins dark brown to dark fuscous.

Length, 3.65 mm.; width, 2.00 mm.

Type, female, Matucana, 7,300 ft. elevation, Peru, taken by C. T. Brues. Museum Comparative Zoology No. 28266.

Resembles *Saldula reperta* Uhler in size, color and markings, but stouter and with broader pronotum. *Reperta* has only four cells in membrane. *Salda rubromaculata* Heidemann from Albemarle Island off the coast of Peru has five cells in the membrane and is herewith transferred to the genus *Pentacora* Reuter. The clavus and corium are largely yellow in *rubromaculata*.

The following is a list of the species of the genus *Pen-*

tacora (Reuter, 1912; genotype, *Acanthia signoreti* Guerin) of the Americas:

1. *angusta* Drake, 1948 Argentina
2. *bruesi* Drake², 1949 Peru
3. *hirta* (Say), 1932 Ind., Iowa, Mass., Conn., Me.,
syn. *pellita* (Uhler), Mass., N. Y., Penna., Md., N. C.,
1877 Miss., Ala., Miss., Tex., Canada
(Quebec).
4. *ligata* (Say) 1832 Me., Mass., N. H., Conn., N. Y.,
syn. *variegata* (Prov.), Md., N. J., N. Y., Penna., Ohio,
1872 Iowa, Ind., Minn., Nebr., Minn.,
Ill., Canada (Man., Ont., Que.).
5. *rubromaculata* (Heide-
mann)², 1901 Galapagos (Albemarle Is.).
6. *signoreti* (Guerin),
1856 Mo., Kan., Colo., Calif., N. H.,
Mass., N. Y., Md., N. J., Ga.,
Iowa, Tex., Ala., N. Mex., N. C.,
S. C., Fla., Mexico, Cuba, Cat
and Long Is. (Bahamas), Haiti,
Porto Rico, Dom. Rep.
7. *sphacelata* (Uhler),
1877 Mass., Conn., N. J., N. Y., Md.,
Mo., Miss., Tex., Calif., Cat.Is.
(Bahamas), Dom. Rep., Cuba.

Saldula sulcata (Barber)

Originally described as *Micracanthia sulcate* Barber, but belongs to the genus *Saldula* Van Duzee. In addition to a paratype from Porto Rico, specimens are at hand from Camp Perrin, British Guiana; Trinidad, B. W. I., Oct. 27, C. J. Drake; Pto. Plata, Dom. Rep., June, 1938, Darlington.

Saldula elongata (Uhler)

Corvallis, Oregon, male, June 26, 1926, C. J. Drake. Distinctly elongate and of a similar color as female, but much smaller in size.

² The generic position of *P. bruesi* and *P. rubromaculata* (Heidemann) will be discussed in a subsequent paper.

Saldula bassingeri, sp. n.

Small, obovate, clothed with short golden pubescence, blackish, scarcely shining, the hemelytra conspicuously marked with large whitish spots or areas. Tylus and juga yellowish white, ocelli amber. Rostrum dark rufo-fuscous, reaching hind coxae. Antennae shortly hairy, brownish black, the basal segment (save large elliptical fuscous spot beneath) and apical portion of second segment yellowish white; proportions: I, 14; II, 26; III, 20; IV, 18. Legs shortly hairy, testaceous; coxæ black-fuscous, shining; femora beneath (save apices) black-fuscous, somewhat shining, above usually with scattered fuscous spots; tibiæ above dark; tarsi darker at tips. Body beneath blackish, the pubescence pale.

Pronotum black, moderately shining, densely clothed with golden, decumbent pubescence, a little narrower in front than eyes, two and a half times as wide as long, deeply excavated behind, the lateral margins moderately rounded; callus only moderately convex, not reaching lateral margins, with large discal impression; lobes separated by transverse, sinuate impression, pitted at bottom of depression, the front lobe twice as long as posterior. Scutellum moderately convex, moderately shining, subequal in length and width, the pubescence as on pronotum. Hemelytra rather densely clothed with reclining pubescence, with large yellowish or flavous markings on corium, the pubescence reclining; membrane pale, semitransparent, with four cells, the base and an elongate spot in each cell brown, the veins darker brown; clavus blackish, with subapical yellowish spot; inner clavus largely blackish, with three spots along lower edge (one subbasal, one near middle and other apical) yellowish white or yellowish; outer corium largely yellowish or yellowish white, the base, a small spot near middle, a quadrate spot beyond middle and an apical spot blackish; the amount of yellowish white or size or dark spots varies somewhat in different specimens.

Length, 2.90–3.20 mm.; width 1.30–1.50 mm.

Type (male), allotype (female) and 50 paratypes,

Riverside, California, Aug. 16, 1937, A. J. Basinger, C. J. Drake and Floyd Andre. Paratypes, San Francisco, 4 specimens, Aug. 11, 1937, collected by Drake and Andre; 2 specimens, Dolores, Colorado, Aug. 16, 1935, C. J. Drake.

Separated from other western *Saldula* Van Duzee by its smaller size and prominent hemelytron markings. When the pubescence is rubbed off, the pronotum is quite shining.

Saldula fernaldi, sp. n.

Moderately large, broad, black, slightly shining, with some brownish markings on hemelytra, the pubescence very short, moderately dense, reclining, golden. Head broad, black, apex and callosities brownish or flavous; ocelli amber. Rostrum dark fuscous, shining, extending to hind coxæ. Antennæ blackish, shortly pilose; largely flavous above, the rest dark fuscous and shining; II brownish apically; proportions: I, 20; II, 40; III, 24; IV, 22. Body beneath black, the pubescence grayish. Legs testaceous, the femora with some dark brown spots.

Pronotum broad, black, slightly shining, broadly roundly excavated behind, moderately narrowed anteriorly, in front a little narrower than head and eyes together, nearly four times as wide as long, the exterior margin slightly rounded; callus moderately raised, not extending on lateral margins, deeply impressed on disc, a little longer than hind lobe; transverse impression behind callus sinuate, moderately deep, pitted at bottom; hind lobe one half as long as frontal. Scutellum black, slightly shining, as wide as long, indistinctly rugulose, the transverse impression near middle. Hemelytra broad, brownish black, dull; clavus with small, brownish subapical spot; corium more or less variable in brownish markings; inner corium with two brownish streaks above middle, a large elongate, circular mark (center dark) in front of middle along lower margin and two or three streaks apically brownish, some times with a very long, narrow, marginal streak, which arises a little behind the base; membrane yellowish brown, basally within and a

long streak in each cell dark fuscous, the lighter areas subhyaline, the veins dark.

Length, 4.25 mm.; width, 2.45 mm.

Type (male) and allotype (female), Flower's cove, Newfoundland, Aug. 17, Dr. Fernald. Paratypes, 5 specimens, taken with type. Type, in Mus. Comp. Zool. No. 28267.

This species is much shorter and not as dull as *S. major* (Prov.). It is much broader and differently colored than *S. pallipes* (Fabr.)

Saldula franciscana, sp. n.

Elongate-ovate, black, shining, with short, rather sparse, golden pubescence, each hemelytron with one (sometimes two) subapical flavous spot. Head polished, with a yellowish spot posteriorly between each ocellus and eye; tylus fuscous-black, polished. Rostrum dark fuscous, reaching to hind coxæ. Antennæ black, moderately stout, shortly pilose, the last two segments with scattered long hairs, second segment above and apical portion of second brownish,—proportions, I, 22; II, 48; III, 30; IV, 32. Body beneath black, with pale pubescence. Leg shortly pilose, mostly brown, or fuscous; coxæ black, polished; femora of fore and middle legs often dark fuscous, all femora towards apex and beneath at base becoming testaceous; tibiæ yellowish to brown, darker basally and apically; tarsi dark apically; middle and hind legs often brown above, beneath on basal half yellowish.

Pronotum highly polished, behind roundly excavated, narrowed anteriorly, the sides practically straight (slightly rounded); callus raised, prominent, with deep, large, discal impression, not extending to lateral margins; lobes divided by a deep, sinuate impression, pitted at bottom of depression, the hind lobe about half as long as frontal; pronotum two and one-half times as wide as long, the callus occupying most of fore lobe. Scutellum moderately convex, subequal in length and width, polished, the transverse impression near the middle. Hemelytra only slightly polished, brownish black, not as black or as polished as pronotum and scutellum, with a moderately large

yellowish-white spot on each side a little before the apex of outer corium, the inner corium sometimes with rather indistinct brownish patches; clavus entirely black, without subapical spot; membrane distinct, slightly fumose. hyaline, with four cells, each cell with a brown spot near its middle, the veins dark brown.

Length, 4.00 mm.; width, 1.80 mm.

Type (male) and 3 paratypes, San Francisco, Calif., collected on rocks in a small stream north of the city, Aug. 11, 1937, by C. J. Drake and Floyd Andre. Female is unknown.

This species has a stouter antennæ than the other American members of the genus. The hemelytra are darker in some examples than others. In one paratype, the hemelytra have two spots on each side. *S. franciscana*, sp. n. is much more slender and more shining than *S. lucuosa* Stål. It also lacks the hairy clothing.



PSYCHE

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